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The method of goalkeeper's evaluation in futsal

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The method of goalkeeper's evaluation in futsal

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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***Key words**: futsal, goalkeeper, evaluation, efficiency of action, game observation, research tool.*

Abstract

Background: *The aim of this study was to develop a research tool used to assess the efficiency a goalkeeper's actions in a game of futsal.*

Material/Methods: *Author's own proposal of an observation sheet was created and subject to a validation procedure. To assess intra-rater reliability and inter-rater reliability, the ICC test was used.*

Results: *There was a strong compatibility of ratings of the intra-rater reliability – 1.00 (95% CI 1.00-1.00) and the inter-rater reliability – 0.99 (95% CI 0.99-1.00), which proves the reliability of the proposed research tool.*

Conclusions: *The developed sheet allows the registration and evaluation of individual performance and cooperation in terms of goalkeeper's game objectives pursued both in offence and defence.*

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Introduction

The concept of models relating to the theory of efficient action relies on drawing conclusions from observations of actual play of competitors of the highest sports level. The observed performance is analysed with reference to the changing situations in the game; they are assessed and systematized to create models reflecting the efficiency of action. Next, the organized action types are compared to match situations of one's own team to create so-called design models. Owing to this procedure, it is possible to rationalize actions in the game by referencing these activities to their cognitively objectified patterns, thereby increasing the efficiency of action in the game by preforming actions deemed efficient and by reducing inefficient actions and eliminating the costly "trial and error" method [1].

Efficiency of an action is understood as the sum of practical values of competing in a game, i.e. favourably rated characteristics of this action, including mainly: activity (the number of a particular type of actions carried out by a player), efficiency (the number of actions performed positively in relation to the pursued objectives of game), and reliability (the ratio of the number of efficient and effective actions to the number of all performances of the given action). Other forms of the efficiency of actions are: rationality (cognitively justified actions), value (a factor being an assessment of the action evaluation) and cost-effectiveness (the ratio of the widely understood result – gains to the incurred costs – losses). Better than others is a player who receives the most positive assessments relativized to the aims of the action, and in the case of the same number of positive assessments, the one whose assessments have the highest value [1, 2].

In team sports games, various research tools are applied to observe players' actions, but observation sheets are especially highly recognised, both among theoreticians and practitioners. However, before they become solid tools for analysis, allowing a reliable assessment of individual players' contribution to the joint work and enabling an accurate evaluation of their performance, they must pass the validation procedure themselves.

Research on the efficiency of actions in soccer with a use of observation sheets has been conducted for decades [2], but it has usually overlooked analyses of the efficiency of goalkeepers' actions. Few studies on players on the goalkeeper's position in 11-man football have been carried out by Szwarc [3], Bergier [4], Kapera [5,6] Syryjczyk [7], Bergier and Soroka [8], Bergier and Syryjczyk [9]. They used different test procedures which, together with the changing rules of the game, prevented detailed comparative analyses. In turn, Szwarc and Chamera's method [10], created on the basis of a praxeological theoretical interpretation which allows a comprehensive assessment of the efficiency of offensive and defensive actions used by goalkeepers, refers to 11-person football.

Indoor soccer (futsal) significantly differs from traditional football. Differences result from different rules of both games and are determined by the competitive environment. Hence for several years there has been intensive research on the game. So far somatic [11, 12, 13, 14], motor [15, 16, 17, 18], psychological [19, 20, 21, 22], as well as technical and tactical [23, 24, 25, 26] determinants have been studied. Among others, Silva et al. [11], Panfil and Paluszek [27], Szwarc [2], Irokawa et al. [28], and Leite [29] dealt with evaluating futsal players' efficiency, but as can be seen from the detailed literature study, the performance of competitors in the goalkeeper's position have not been studied yet. Therefore, on the basis of our own competitive experience, expert opinions, and the created by Szwarc and Chamera [10] observation sheet for a goalkeeper in the 11-person game, we have attempted to create a research tool to assess the efficiency of a goalkeeper's actions in a game of futsal.

Material and methods

The following methodology research procedure was adopted. First, Panfil's [1] structure of a tabular model of team play was adapted to the specifics of the goalkeeper's game in futsal. Using one's own competitive and coaching experience and the available literature, a preliminary outline of an assessment sheet of the goalkeeper's game in futsal was created. Then, analysing a match, necessary adjustments in the developed sheet were made and actions appearing in the game were ultimately defined.

The observation sheet was designed to take into account objectives of the game, types of actions and the place and the result of the undertaken action (Append. 1-6). The futsal goalkeeper, like the goalkeeper in an 11-person team, carries out the following objectives in attack: he keeps the ball, gains the playfield with the ball, creates situations to score a goal, scores a goal. In defence he prevents scoring goals and creating situations to score them [2]. He meets these objective in a way relatively dependent (individual actions) or strictly dependent on his partners' actions (cooperation).

In preventing the loss of goals a goalkeeper uses:

- catching the ball without falling to the ground - in place (only feet have contact with the ground, e.g. in bend), in one-leg kneeling (one knee touches the ground), in kneeling (both knees touch the ground), in jumping;
- catching the ball with falling to the ground (so-called diving save and catching in a hurdler's straddle);
- punching clear (with or without falling);
- pushing the ball (in positions same as for catching the ball);
- defending with legs (with or without falling);
- situational defence (acting out of necessity, usually after a shot from close range, e.g. the so-called follow-up shot);
- defence in a 1x1 situation (in a situation of relative freedom of action – without defenders' assistance);
- defending penalty kicks (from 6 meters - in a regular time; from 7 meters - after extra time; from 10 meters - the so-called extended penalty kick for the fifth and subsequent foul in one half of the match);
- defence in set pieces of the game (completed with a catch or pushing the ball) following a hit from a direct and/or indirect free kick, a throw-in, a corner kick;
- actions without contact with the ball (the goalkeeper performs an action but does not touch the ball);
- others (e.g. lack of a goalkeeper's response during the opponent's successful shot).

Actions carried out in a way absolutely dependent on partners' actions (cooperation) – consequential doubling:

- catching the ball (action after a partner's earlier intervention – e.g. blocking the ball);
- situational defence (acting out of necessity or pushing the ball after earlier cooperation with a partner – e.g. after the partner's ineffective blocking the ball, defending the so-called ricochet);
- defending without contact with the ball (action without contact with the ball, e.g. a partner blocks the shot while the goalkeeper intervenes by e.g. a diving save).

In preventing the creation of a situation to score goals goalkeepers perform the following actions:

- overtaking the opponent / taking control of the ball in the penalty area – catching the ball;
- overtaking the opponent / kicking out the ball in the penalty area – punching the ball clear, pushing the ball, situational action (with or without falling);
- defence / intervention without contact with the ball (blocking, screening, shielding the ball);
- overtaking the opponent / taking control and/or kicking the ball outside the penalty area (with or without falling);
- defence / intervention without contact with the ball (blocking, screening, shielding the ball).

Cooperation by consequential doubling completed by:

- catching the ball with or without falling to the ground (e.g. after blocking an opponent by a partner);
- kicking out the ball (e.g. after blocking the ball by a partner)
- defence without contact with the ball (e.g., team partner blocks an opponent, but he crosses or shoots towards goal, the ball passes the goal and goalkeeper intervenes).

The purpose of offensive actions in futsal is to score goals, to create situations to score, to gain the playfield with the ball and to keep the ball.

The goalkeeper can score
- without contact with the opponent by:
- hitting the ball with his foot, head, or situationally (with another part of the body);
- hitting the ball dropped from hand (from volley, half-volley, so-called "flat" volley);
- hitting the ball from a direct or indirect free kick;
- in direct contact with the opponent by:
- hitting the ball with his foot, head, or situationally (with another part of the body);
- hitting the ball dropped from hand (from volley, half-volley, so-called "flat" volley).

When creating situations to score goals goalkeepers apply the following actions:
- throwing the ball with a hand
- throw-in from the hip
- one-handed overhand throw
- another type of throw-in (e.g. with both hands, with a low swing);
- passing the ball with the foot after dropping it from the hand (from volley, half-volley, so-called "flat" volley);
- passing the ball with the foot from the ground (after reception, without reception, after interception, after faking and/or dribbling, from a set-piece).

The goalkeeper is likely to gain the playfield by acting individually or with a partner. In cooperation he performs:
- throwing the ball with a hand (with a low swing, with one-handed overhand throw, with both hands, or in another way);
- passing the ball with the foot after dropping it from the hand (from volley, half-volley, so-called "flat" volley);
- passing the ball with the foot from the ground (after reception, without reception, after interception, after faking and/or dribbling, from a set-piece).

Acting individually:
- he fakes and/or dribbles (the player keeps the ball for more than 1 second) with his foot or situationally (with another part of the body).

As a result of cooperation the goalkeeper can keep the ball by:
- catching the ball after a pass from a partner;
- receiving the ball passed by a partner (with his leg, situationally – with another part of the body);
- passing the ball (playing backwards towards his own goal)
- with his foot in a situation of constructing a positional attack (so-called "zip") in the opponent's half,
- situationally (with another part of the body);
- and, individually, by:
  - sliding tackle keeping the ball in the game (with the foot or situationally – with another part of the body),
  - faking and/or dribbling (e.g. putting the ball in his own penalty area – with the foot),
  - catching the ball after faking, dribbling and/or intercepting the ball (with or without falling to the ground).

In addition, the sheet takes in account the division of the pitch into 2 sectors and 3 zones A (Fig. 1). In sector A two zones have been distinguished: A1 – the goal area and A2 – the field of defence area from the goal line to the half-way line of the pitch with the exception of the goal area. In sector B zone A3 has been distinguished – the field of attack area from the half-way of the pitch to the end line.

In the next stage the validation procedure of research tool was carried out using the methodology proposed by Szwarc and Chamera [10]. In order to assess the intra-rater reliability, the test-retest method was used (with a one-month interval, in identical conditions, and by the same rater) to analyse the play of goalkeepers Tiago de Melo Marinho from Brazil and Juan José Angosto Hernández from Spain in the final match of the World Cup in 2012 in Thailand. To assess the inter-rater reliability of the observation sheet, three experts (licensed coaches) were invited.

The experts evaluated actions carried out by the goalkeepers Gustavo Lobo Paradeda from Russia and Luis Amado from Spain in the final match of the 2012 European Championships in Croatia. Prior to the test, the defined activities were discussed with them and instructions for the registration of data were provided. Experts, independently of each other, replayed the audio-visual recording of the match using the freeze-frame function (TV-Sharp Aquos LC46LE830E, DVD – Yamaha 8520), entering the data of the game onto the observation sheet.

The results obtained from the study were subjected to statistical analysis be means of the Intraclass Correlation Coefficient (ICC) test. In order to check the conformity of assessments of the intra-rater reliability, ICC (2,1) was used, and to assess the inter-rater reliability - ICC (3,1) [30]. ICC test results were interpreted as follows: 0-0.2 slight conformity, 0.3-0.4 satisfactory conformity, 0.5-0.6 average conformity, 0.7-0.8 strong conformity and above 0.8 almost perfect conformity [31]. In the ICC test for each of the cases the confidence interval (CI) at 95% was applied. For statistical analysis MedCalc (MedCalc Software, Belgium) was used.

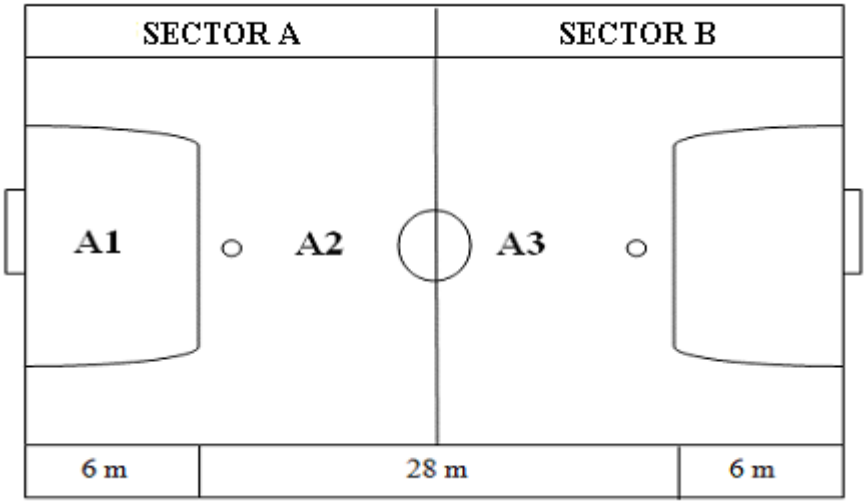

Fig.1. Division of the pitch into sectors and zones

Results

The value of the ICC index for intra-rater reliability both for actions in defence and offence point to almost perfect conformity of expert evaluation – 1.00 (95% CI 1.00–1.00). Excellent conformity of evaluation was obtained for offensive actions, whose aim was to (Tab. 1): score goals, create a situation to score and to position the game (gain the playfield with the ball and keep the ball) – 1.00 (95% CI 1.00–1.00). In defensive actions a very high degree of conformity of indications was also found, especially for actions against creating a situation to score a goal – 1.00 (95% CI 0.98–1.00) and actions against losing a goal – 1.00 (95% CI 0.99–1.00).

It follows from the data in Table 2 that the ICC index for inter-rater reliability for all the tested actions amounted to 0.99 (95% CI; 0.99-1.00). The highest conformity of assessments among the experts was found in relation to actions aimed at creating a situation to score a goal – 1.00 (95% CI; 1.00–1.00). High ICC conformity was achieved in preventing a situation to score a goal – 0.99 (95% CI; 0.98–1.00) and keeping the ball – 0.99 (95% CI; 0.97–1.00) as well as in actions aimed at gaining the playfield with the ball – 0.99 (95% CI; 0.96–1.00) and preventing the loss of goals – 0.98 (95% CI; 0.95–1.00). The lowest conformity was found in actions whose aim was to score a goal – 0.94 (95% CI; 0.66–1.00).

Table 1. Results for intra-rater reliability

Elements of assessment	Expert assessment	Number of offensive actions				Number of defensive actions	
		Scoring goals	Creating situations to score	Gaining the playfield	Keeping the ball	Preventing a situation to score a goal	Preventing scoring a goal
Intra-rater reliability ICC (2,1)	Test 1	1	10	147	75	50	56
	Test 2	1	10	148	72	50	54
ICC for intra-rater reliability		1.00	1.00	1.00	1.00	1.00	1.00
Lower conf. limit		1.00	1.00	1.00	1.00	0.98	0.99
Upper conf. limit		1.00	1.00	1.00	1.00	1.00	1.00

Table 2. Results for inter-rater reliability

Elements of assessment	Expert assessment	Number of offensive actions				Number of defensive actions	
		Scoring goals	Creating situations to score	Gaining the playfield	Keeping the ball	Preventing a situation to score a goal	Preventing scoring a goal
Inter-rater reliability ICC (3,1)	Expert 1	1	2	152	83	34	99
	Expert 2	1	2	181	108	38	98
	Expert 3	2	2	183	119	38	94
ICC for inter-rater reliability		0.94	1.00	0.99	0.99	0.99	0.98
Lower conf. limit		0.66	1.00	0.96	0.97	0.98	0.95
Upper conf. limit		1.00	1.00	1.00	1.00	1.00	1.00

Discussion

The purpose of the study was to develop an observation sheet to evaluate the play of a futsal goalkeeper. The developed research tool enables an assessment of actions performed with a view to the realised objectives in the game by the goalkeeper, i.e. scoring a goal, creating a situation to score, gaining the playfield with the ball, keeping the ball and preventing the creation of a situation to score a goal and preventing its scoring. Furthermore, apart from the assessment of individual

actions, the tool allows distinguishing and evaluating actions absolutely dependent on partners' actions (cooperation between the goalkeeper and his partners).

The observation sheet has undergone the validation procedure. To assess both the intra-rater reliability and the inter-rater reliability), the ICC test was applied, being recognized as the best tool to check the reliability of the measurements or assessments [30,32].

The results obtained in the study of the intra-rater reliability of the observation sheet demonstrate almost perfect conformity of assessments – 1.00 (95% CI 1.00–1.00), which seems obvious and proves that the actions have been precisely defined. A favourable condition was also the fact that the assessment of the game was performed by one expert. Similar results of intra-rater reliability (ICC within the limits of 0.96–1.00) were obtained by Tenga et al. [33] and Szwarc and Chamera [10] in relation to the validation of observation sheets in 11-person football.

The results of the study of inter-rater reliability also confirm the value of our research tool (ICC value ranged from 0.94 to 1.00). Almost perfect conformity of ratings was obtained in actions whose aim was to create a situation to score a goal, to gain the playfield with the ball, to keep the ball and to prevent creating a situation to score (0.99–1.00 ICC). This is understandable due to the ease of assessing these elements of the game. In actions against scoring a goal the ICC value amounted to 0.98. A detailed analysis of the study results showed that the greatest difficulties in the interpretation of the types of actions regarded defending the ball with feet (experts' indications: 10, 14, 11, respectively) and the goalkeeper' defence/intervention with no contact with the ball (20, 16, 14). Statistically, the lowest conformity of assessments was achieved for actions whose aim was to score a goal (0.94 ICC). The result of the test could be considered surprising, but it should be noted that the ICC value was determined by a small number of registered actions (respectively: 1, 1, 2) evaluated differently by experts as hitting the ball dropped from the hand in contact with the opponent and as hitting performed without the opponent's assistance.

The analysis of available literature [34, 35, 36] shows that the high values of the ICC index, indicating perfect conformity of the evaluation, primarily relate to individual actions, which was also confirmed by our study, and lower values of the ICC usually relate to activities strictly dependent on partners (cooperation). This is due to the difficulty of estimating the contribution of individual players in a joint action. ICC values obtained in our study, both those relating to the inter-rater and the intra-rater reliability, indicate almost perfect conformity of evaluation and prove the reliability of the research tool proposed by us.

Conclusion

The proposed observation sheet meets the requirements for reliability and relevance of a research tool and can be used to evaluate the efficiency of the goalkeeper's actions in a game of futsal.

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Appendix 1. Observation sheet to assess futsal goalkeeper's game – scoring a goal

Game objectives	Way of performance	Completion of action	Way of completing the action	Activity						Efficiency					
				Time intervals						Time intervals					
				1-20			21-40			1-20			21-40		
				pitch sectors A, B						pitch sectors A, B					
				pitch zones						pitch zones					
				A1	A2	A3	A1	A2	A3	A1	A2	A3	A1	A2	A3
scoring goals	Individually without contact with an opponent	Hitting the ball	*with a foot*												
			with the head												
			situationally												
		Hitting the ball dropped from hand	*from volley*												
			from half-volley												
			from "flat" volley												
		Hitting the ball from a direct or/and indirect free kick													
	Individually in direct contact with an opponent	Hitting the ball	*with a foot*												
			with the head												
			situationally												
		Hitting the ball dropped from hand	*from volley*												
			from half-volley												
			from "flat" volley												

Appendix 2. Observation sheet to assess futsal goalkeeper's game – creating a situation to score a goal

Game objectives	Way of performance	Completion of action	Way of completing the action	Activity						Efficiency					
				Time intervals						Time intervals					
				1-20			21-40			1-20			21-40		
				pitch sectors A, B						pitch sectors A, B					
				pitch zones						pitch zones					
				A1	A2	A3	A1	A2	A3	A1	A2	A3	A1	A2	A3
Creating a situation to score a goal	Cooperation	Throw-in by hand	*flat throw from the hip*												
			one-handed over-hand throw												
			another throw												
		Passing the ball dropped from hand	*from volley*												
			from half-volley												
			from "flat" volley												
		Passing the ball from the ground with a foot	*upon reception*												
			without reception												
			after faking and/or dribbling												
			from a set-piece												

Appendix 3. Observation sheet to assess futsal goalkeeper's game – gaining the playfield with the ball

Game objectives	Way of performance	Completion of action	Way of completing the action	Activity						Efficiency					
				Time intervals						Time intervals					
				1-20			21-40			1-20			21-40		
				pitch sectors A, B						pitch sectors A, B					
				pitch zones						pitch zones					
				A1	A2	A3	A1	A2	A3	A1	A2	A3	A1	A2	A3
Gaining the playfield	Cooperation	Throw-in by hand	*with a low swing*												
			flat throw from the hip												
			one-handed overhand throw												
			with two hands												
			another throw												
		Passing the ball dropped from hand	*from volley*												
			from half-volley												
			from "flat" volley												
		Passing the ball from the ground with a foot	*upon reception*												
			without reception												
			upon interception												
			after faking and/or dribbling												
			from a set-piece												
	Individually	Faking and/or dribbling	*with a foot*												
			situationally (another body part)												

Appendix 4. Observation sheet to assess futsal goalkeeper's game – keeping the ball

Game objectives	Way of performance	Completion of action	Way of completing the action	Activity						Efficiency					
				Time intervals						Time intervals					
				1-20			21-40			1-20			21-40		
				pitch sectors A, B						pitch sectors A, B					
				pitch zones						pitch zones					
				A1	A2	A3	A1	A2	A3	A1	A2	A3	A1	A2	A3
Keeping the ball	Individually	Sliding tackle keeping the ball in the game	*with a foot*												
			situationally (another body part)												
		Faking and/or dribbling	*with a foot*												
			other												
		Catching the ball after faking and/or dribbling	*with falling*												
			without falling												
	Cooperation	Catching the ball after passing from a partner	*with falling*												
			without falling												
		Receiving the ball from a partner	*with a foot*												
			situationally (another body part)												
		Passing the ball (passing backwards)	*with a foot*												
			situationally (another body part)												
		Passing the ball from a set-piece													

Appendix 5. Observation sheet to assess futsal goalkeeper's game – preventing scoring a goal

Game objectives	Way of performance	Completion of action	Way of completing the action	Activity		Efficiency	
				Time intervals		Time intervals	
				1-20	21-40	1-20	21-40
				pitch sectors A		pitch sectors A	
				pitch zones		pitch zones	
				A1	A1	A1	A1
Preventing scoring a goal	Individually	Catching the ball	*in place (without falling)*				
			in one-leg kneeling				
			in kneeling				
			in jumping				
			diving save				
			in a hurdler's straddle				
		Punching clear	*with falling*				
			without falling				
		Pushing	*in place (without falling)*				
			in one-leg kneeling				
			in kneeling				
			in jumping				
			diving save				
			in a hurdler's straddle				
		Defence with legs	*without falling*				
			with falling				
		situational defence					
		defence in a 1x1 situation					
		Saving a penalty kick	*from 6m*				
			from 10 m (extended)				
			from 7 m (after extra time)				
		Saving shots after set-pieces	*direct or/and indirect free kick*				
			throw-in				
			corner kick				
		saving/intervention without contact with the ball					
		Another situation					
	Cooperation	Consequential doubling (cooperation of a player with the goalkeeper)	*Catching the ball (e.g. after blocking, ricochet)*				
			Situational defence				
			Defence without contact with the ball				

Appendix 6 Observation sheet to assess futsal goalkeeper's game – preventing creation of a situation to score a goal

Game objectives	Way of performance	Type of action	Completion of action	Way of completing the action	Activity						Efficiency					
					Time intervals						Time intervals					
					1-20			21-40			1-20			21-40		
					pitch sectors A, B						pitch sectors A, B					
					pitch zones						pitch zones					
					A1	A2	A3	A1	A2	A3	A1	A2	A3	A1	A2	A3
Preventing creation of a situation to score a goal	Individually	overtaking an opponent in the penalty area	Catching the ball	*in place (without falling)*												
				in one-leg kneeling												
				in kneeling												
				in jumping												
				diving save with falling												
			Punching clear	*with falling*												
				without falling												
			Pushing	*in place (without falling)*												
				in one-leg kneeling												
				in kneeling												
				in jumping												
				diving save with falling												
			Intercepting / clearance without falling to the ground	*with a leg*												
				with the head												
				situationally (another body part)												
			Intercepting / clearance with falling to the ground	*with a leg*												
				with the head												
				situationally (another body part)												
			Saving/intervention without contact with the ball	*blocking, screening shielding the ball*												
		overtaking an opponent outside the penalty area	Intercepting / clearance without falling to the ground	*with a leg*												
				with the head												
				situationally (another body part)												
			Intercepting / clearance with falling to the ground	*with a leg*												
				with the head												
				situationally (another body part)												
			Saving/intervention without contact with the ball	*blocking, screening shielding the ball*												
	Cooperation	Consequential doubling (cooperation of a player with the goalkeeper)		*Catching the ball*												
				Clearance with and / or without falling												
				Intervention without contact with the ball												