ANALAYIS OF SOCCER GOAL KEEPER PASSING:

HOW GOAL KEEPER PASSING CANNOT WIN A GAME, BUT CAN LOSE A GAME

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Abstract: Since FIFA's introduction of the "back-pass" law, the goal keeper has become an integral part of their team's offense. Goal keepers are used as a mechanism for switching sides of the field, a "relief valve" when a defender is under pressure, and to start to the offense when the goal keeper gains possession. Goal keepers have three basic passing options: (1) short pass, (2) long pass to center of the field, (3) long pass to the sideline. The question: which passing option leads to possession, final third penetration, and a positive game outcome (i.e. win)?

This paper analyzes the passes made by the goal keepers in 31 games for a Major League Soccer (MLS) team. The results show that on average the MLS goal keeper makes 16 passes per game. For every short pass there are two long passes. The probability of a successful short pass is 95%, and 37% successful for the long-pass. Long passes to the side are 2.1 times more likely to be completed than long passes to the middle. Although, long passes result in loss of possession two thirds of the time (37%), the next final third penetration in the game is split 50/50 between own team and opponents. Although short passes maintained possession (i.e. denying the opponents attacking opportunities), they yielded a final third penetration for own team only 50% of the time. Further, **in 71% of the games in which short passes resulted in turnovers, the team lost the game**. The implications of these results on game strategy (short vs long passes), training, and the concept of a real-time decision support device to advise goal keepers on their best passing option are discussed.

INTRODUCTION

The introduction by the "back-pass" law by FIFA in 1992 changed the role of goal keepers (FIFA, 2015). The new rules prohibit the goalkeeper from handling the ball when a team-mate has deliberately "kicked" the ball to him, or handling the ball directly from a team-mate's throw-in. If the goal keeper intentionally handles the ball, an indirect free-kick is awarded to the opposing team at the location where the ball was handled. In this way goal keepers changed from being "shot stoppers" to being an extra field player and became an integral part of their teams possession and offense.

Goal keepers, who are always unmarked and have vision of the whole field (Cruff, 1996), are now considered an "outfield" player who can maintain possession and start the offense. Goal keepers role in passing falls into three broad categories. Firstly, goal keepers are used to switch the play (also known as circulate the ball). A left back may pass the ball to the goal keeper, who will pass the ball across the field to the right back. Secondly, goal keepers are used to relieve defensive pressure from the opposing team high up the field. Typically a center back or midfielder may find themselves under pressure by an opposing player with no passing options. This player can pass the ball back to the goal keeper who will then find an open team mate. Thirdly, the goal keeper can start the offense after gaining possession of the ball (e.g. saving a shot on goal). For example, see Luis Suarez's goal for Argentina in the 2014 World Cup (Youtube, 2014).

Goal keepers have three basic options for passing: (1) a short pass or throw to a player in their own half, (2) a long kick or punt down the middle of the field, or (3) a long kick or punt to the sides of the field. One of the benefits of passing to the goal keeper is that it opens up the field. Meaning it gives opportunity for their team mates to spread out which can open up the passing lanes for all players as well as start an offensive passing sequence from an improved starting point.

This raised the question: What passing option is best for the outcome of the game (i.e. wins), own team final third penetration, and shots on goals?

Previous analysis of MLS statistics show that the long pass is not a good tactic for keeping possession or for launching an attack (Nimanjeb, 2015). Long passes send the ball to the other team slightly more than 6 times out of 10. The best keeper long pass turns over the ball less than 5 times out of 10. The worst keepers for accuracy turn the ball over on long passes 7 times out of 10 times. Goal keeper successful passing statistics are not correlated with overall team possession in the EPL (Zonalmarking, 2015). However, goal keepers short passing success rate is directly correlated with overall team possession (Zonalmarking, 2015).

This paper analyzes the completion rate of passes made a goal keeper for one Major League Soccer (MLS) team and correlates successful passing percentage with: final third penetration, final third possession, and game outcomes (i.e. win/loss). The results are highlighted below:

- On average the goal keeper makes 16 passes per game (with a low of 7 and high of 31)
- The ratio between long and short passes is 1.7 (i.e. approximately two times more long passes than short)
- The probability of successfully completing a short pass is 85%
- The probability of successfully completing a long pass is 30% (28% long central and 28% long side)
- The goal keeper pass success percentage (long or short) is <u>not</u> correlated with game outcomes
- The goal keeper pass success is <u>not</u> correlated with final third pass counts.
- **71% of the games in which the goal keeper turns the ball over on a short pass result in a loss.**
- **After a long pass, the next final third penetration is split 50/50 between own team and opponents.**

These results show that goal keeper passing does not necessarily win games, but can lose games (i.e. from short pass turn overs). Further, there is no advantage of the long pass over the short pass in terms of final third penetration, however a team that can find a way to improve the success rate of the long pass could gain a tactical advantage in field position and final third penetration.

One significant finding is that **goal keepers turnovers on short passes are game changers**. This leads to two conclusions. First, the specific situations in which this occurs should be studied with game video to understand why the goal keeper and the players receiving the pass made the decision and how to adjust for game situations. Second, it may be useful for practice (and games) to develop a real-time decision-making device to advise goal keepers on the best pass in each situation.

This paper is organized as follows: the next section describes the method for analysis, followed by the results. Conclusions discuss the implications of these results.

METHOD OF ANALYSIS

The length and direction of passes made by goal keepers for DC United MLS team were manually recorded from the MLS Opta Chalkboard ("Boxscores" on mlssoccer.com). The chalkboard option was set to Distribution and the goal keeper was selected. The passes were counted manually according to the location shown in Figure 1. The data was recorded in the table also shown in Figure 1. DC United was selected as they have a sufficient number of wins and losses to make correlations.
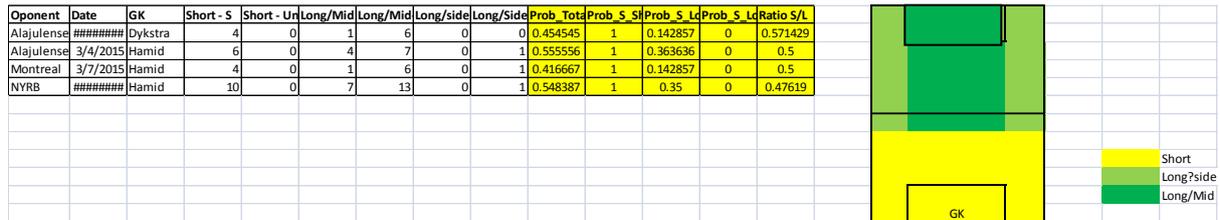
Oponent	Date	GK	Short - S	Short - Un	Long/Mid	Long/Mid	Long/side	Long/Side	Prob_Tota	Prob_S_Sh	Prob_S_Lo	Prob_S_Lo	Ratio S/L
Alajulense	########	Dykstra	4	0	1	6	0	0	0.454545	1	0.142857	0	0.571429
Alajulense	3/4/2015	Hamid	6	0	4	7	0	1	0.555556	1	0.363636	0	0.5
Montreal	3/7/2015	Hamid	4	0	1	6	0	1	0.416667	1	0.142857	0	0.5
NYRB	########	Hamid	10	0	7	13	0	1	0.548387	1	0.35	0	0.47619

Short
Long?side
Long/Mid
GK

FIGURE 1: Rules for length and direction of passes, and table for collecting data.

The parameters recorded and calculated are shown below:

- Number of Passes per Game (NP)
- Number of Short Passes per Game (NSP)
    - Number of Successful/Unsuccessful Short Passes per Game (NSSP, NUSP)
    - Number of Next Final Third Penetration for Own/Opponent
- Number of Long Passes per Game (NLP)
    - Number of Long Central Passes per Game (NLCP)
        - Number of Successful/Unsuccessful Long Passes per Game (NSLCP, NULCP))
        - Number of Next Final Third Penetration for Own/Opponent
    - Number of Long Side Passes per Game (NLSP)
        - Number of Successful/Unsuccessful Long Passes per Game (NSLSP, NULSP)
        - Number of Next Final Third Penetration for Own/Opponent

RESULTS

The results of the analysis are shown in Table 1. The average number of passes per game was 16.7 with a minimum of 7 and a maximum of 31. The standard deviation was 5.8 meaning that 66% of the games had more than 10.9 passes and less than 22.5 passes. The median was 16 indicating that the distribution was a normal distribution (i.e. a bell-curve). The completion rate for all goal keeper passes was 54%.

Thirty eight percent (38%) of the passes were short passes. On average there were 6 short passes per game with a minimum of 0 and a maximum of 13. Eighty five percent (85%) of the short passes were successful.

Sixty two percent (62%) of the passes were long passes. There were on average 10.7 long passes per game with a minimum of 3 and a maximum of 21. There was a lot of variance in long passes per game with a mean to standard deviation ratio of 2. **Only 30% of the long passes were successful**.

There were two types of long passes: central and side. There were on average 7.6 central long passes and 3.1 side long passes. The long central passes were successful only 28% of the time. The long side passes were successful 28% of the time as well.

TABLE 1: Statistics for Goal Keeper passing.

Statistics	Acronym	Min	Mean	Max	Std Dev	Percent Complete
Number of Passes per Game	**NP**	**7**	**16.7**	**31**	**5.8**	54%
Number of Short Passes per Game	NSP	0	6	13	3.6	85%
Number of Successful Short Passes per Game	*NSSP*	*0*	*5.7*	*13*	*3.7*	
Number of Unsuccessful Short Passes per Game	*NUSP*	*0*	*0.3*	*2*	*0.6*	
Number of Long Passes per Game	NLP	3	10.7	21	5.0	30%
Number of Long Central Passes per Game	NLCP	2	7.6	20	4.5	28%
Number of Successful Long Central Passes per Game	*NSLCP*	*0*	*2.3*	*7*	*2.0*	
Number of Unsuccessful Long Central Passes per Game	*NULCP*	*1*	*5.3*	*13*	*3.1*	
Number of Long Side Passes per Game	NLSP	0	3.1	11	2.7	28%
Number of Successful Long Side Passes per Game	*NSSLP*	*0*	*1.1*	*6*	*1.4*	
Number of Unsuccessful Long Side Passes per Game	*NUSLP*	*0*	*2*	*6*	*1.8*	

Does goal keeper successful passing correlate with and game outcomes (i.e. win/loss), final third pass counts, and final third penetration?

Goal Keeper Successful Passes are not Correlated with the Outcome of the Game

Analysis of game outcomes (ie. Win/lose) shows that the successful pass percentage by goal keepers is not correlated with winning or losing games. The same is true for short, central long, and side long passes. There is no correlation between successful pass percentage and game outcome.

Goal Keeper Short Pass Turnovers Lose Games 71% of the Time

Although in the majority of the games (24 out of 31) there were no unsuccessful short passes, in the games that did result in one or more turn-overs from short passes, the team lost the game. In 5 of the 7 games (71%) that contained 1 or more unsuccessful short passes, the team lost the game (see Table 2). Turnovers in front of the goal have high percentage opportunity for the opponent to score.

TABLE 2: 5 out of 7 games with a short pass turnover lead to a loss

				Goal Diff			
		-2	**-1**	**0**	**1**	**2**	**3**
Short-Un	**0**	2	3	5	10	3	1
	1	0	4	0	1	0	0
	2	1	0	0	1	0	0

Goal Keeper Long Passes not Correlated with Final Third Number of Passes or Outcome of the Game

An analysis of the number of passes in the final third and the goal differential (i.e. wins and losses) showed no correlation (see Table 3). Therefore, the goal keeper's distribution into possession in the final third would not have any impact on the outcome of the game.

TABLE 3: The number of passes in the final third does not correlate with wins/losses. Final third pass counts (>=120) occur 4 times in losses and 6 times in wins. Low final third pass counts (<120) occurred in 10 games.

				Goal Diff			
Final Third Passes		**-2**	**-1**	**0**	**1**	**2**	**3**
	60	0	2	0	2	0	0
	80	0	2	0	2	1	0
	100	1	1	2	3	2	0
	120	2	2	1	4	0	1
	140	0	0	2	1	0	0
	160	0	0	0	0	0	0

Goal Keeper Long Passes Lead to Even Split in Next Final Third Penetration

Although approximately two-thirds of long passes initially result in possession to the opponents, an analysis of the next penetration following long passes shows that it is split 50/50 between own team and opponents.

CONCLUSIONS

Goal Keeper Passing Does not Win Games but Can Lose Games 71% of the time

This analysis shows that goal keeper passing does not influence their team's ability to score goals. However, goal keeper passing does affect the goals scored-against resulting in losses. Specifically in the case of turnovers from short passes. With a 71% chance of resulting in a loss, mistakes by goal keepers on short passes, while rare, are incredibly lethal.

Goal Keeper Long Passes do not Create More Attacks

The number of long passes and accuracy of long passes, central and side, do not correlate with the outcome of the game or the number of passes in the opponents final third. Also, after a long pass, the next final third penetration is split 50/50.

Long Passes vs. Short Passes?

These results, based on the available pass data (only) are inconclusive on whether a long or short pass is the best option. Based on the pass data, advantage of possession from short passes (i.e. denying the opponents the ball and starting an attack) must be compared with the risk of a turnover on a short pass.

The long pass does not lead to possession but does lead to an even split in next final third penetration.

So if possession can be correlated with final third penetration, shots on goal and denying the opponents with final third penetration, then goal keepers are better off risking a short pass.

Future Work

Compare Statistics Between Teams

There are several ways in which this work can be extended. One way is to the same analysis for all teams in the MLS and in other leagues. If a teams statistics differ from the normal, then a more detailed analysis could be done to see what they are doing differently.

Analyze Player Positioning for Long Passing

Also this analysis was limited by only looking at passing statistics (and not player positioning). The positioning of the players receiving the pass was not evaluated, neither was positioning of adjacent own team and opponents players. For example, some teams position players in close proximity for long passes while others remain wide. Also, the ability of receiving players and defending players should also be evaluated. All of this requires additional data.

Player positioning could also be useful for examining the circumstances in which short passes result in turn overs. Is there a specific type of high pressure that works best for creating short pass turn overs?

Goal Keeper Real-time Decision Support Tool

It may be possible to design a computerized device to give goal keepers advice each time they have the ball (Figure 2). For example a small wrist device could emit different audible signals for short, long central and long side passes. The decision may be made by a coach observing the game or it could be fed by real-time data feed of player and ball position data. The tool could be used for training or scrimmages. It may not be used in games.
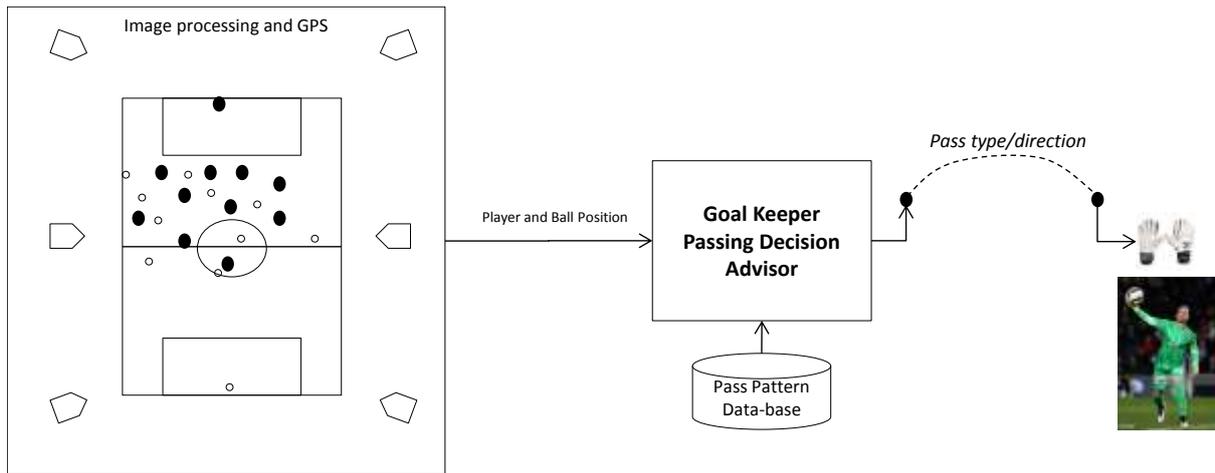
FIGURE 2: Functional diagram of Goal Keeper Real-Time Decision Support Advosor

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