

THE EFFECTS OF THE RED CARDS IN KNOCKOUT COMPETITIONS: AN ANALYSIS OF THE UEFA EUROPA LEAGUE

Los efectos de la tarjeta roja en competiciones eliminatorias: un análisis de la UEFA Europa League

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ABSTRACT: This paper analyses the influence of red cards in the UEFA Europa League. This competition relies on a different format, with a relatively small number of matches and high uncertainty of outcome. For this reason, it can be foreseen how playing part of the game with one or more players sent off due to red cards could affect the teams' performance. Furthermore, the possible change in the game tendency for both teams is studied. We have considered five seasons, in which 200 matches involved dismissals, analysing the relationship of red cards with six variables: fouls, yellow cards, corners, shots on target, ball possession, and goal differences. The results show that red cards change the sport tactics developed by teams, with an increase in offensive actions and ball possession for teams with more players. The results may have significant implications for sport coaches in terms of tactics and strategies.

KEY WORDS: UEFA Europa league, Red cards, Goals, Football, Sport performance.

RESUMEN: Este estudio analiza la influencia de las tarjetas rojas en la UEFA Europa League. Esta competición tiene un formato diferente a las ligas regulares, con un número relativamente pequeño de partidos y una alta incertidumbre de resultado. Por esta razón, se supone que jugar parte del partido en inferioridad numérica debido a las tarjetas rojas podría afectar el rendimiento de los equipos. Además, se estudia el posible cambio en la tendencia del juego para ambos equipos. Hemos considerado cinco temporadas, donde sucedieron 200 expulsiones. Hemos analizado la relación de las tarjetas rojas con seis variables: faltas, tarjetas amarillas, córneres, remates a portería, posesión del balón, y diferencia de goles. Los resultados muestran que las tarjetas rojas cambian las tácticas deportivas desarrolladas por los equipos, con un aumento de las acciones ofensivas y de la posesión de balón para los equipos con superioridad numérica. Los resultados pueden tener implicaciones significativas para los entrenadores deportivos en términos de tácticas y estrategias.

KEY WORDS: UEFA Europa League, Tarjeta roja, Goles, Fútbol, Rendimiento deportivo.

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1. Introduction

Currently, football is the world's most popular sport in terms of fans and incomes (FIFA, 2017). The literature has analysed the key determinants of sport performance in football in order to win matches, attract spectators, and increase incomes (Carmichael, et al., 2000; Oberstone, 2009; Liu, et al., 2015; Zambom-Ferraresi, et al., 2017).

The football plays are usually classified as attack and defense plays. Among the defensive plays, the fouls and yellow/red cards have hardly received attention. Nevertheless, they could be relevant because they can affect the result in a football match. Fouls and misconduct in football are acts committed by players which are deemed by the referee to be unfair. Fouls and misconducts interfere in the flow of the game and are subsequently penalized. Law 12 of the Laws of the Game (IFAB, 2015) addressed this issue and the disciplinary sanctions for the fouls and misconducts are yellow and red cards.

When a player is sent off from the game is an important factor in many team sports. In football, an expulsion occurs when the referee penalizes a player with a red card, and this fact can be given by the accumulation of two yellow cards in the same match or by a direct red card. Unlike other sports, the team of the player who has received this penalty will play the remaining time of the match in numerical inferiority. The fact of playing part of the game with one less player makes it an important factor throughout its course.

The impact of an expulsion in football was previously analysed in other football competitions (i.e., Ridder, et al., 1994; Carmichael et al., 2000; Vecer, et al., 2009; Greenberg, 2015; Cervený, van Ours, & Tuijl, 2018). However, as far as we know the effects of an expulsion in the UEFA Europa League have never been analysed. We consider that analysis of this competition is of interest, not only for its importance in Europe, but also due to its specific format. In fact, the UEFA Europa League has a format different from that of the major regular European leagues, which are round-robin or double round-robin format. The Europa League, as most of the cups, is an eliminatory competition where the winner of a match or round-trip matches will qualify to the next stages of the competition, until only the champion remains. In a competition with these characteristics, the teams have a minimal error margin, so the impact of a red card on the results of the competition seems worthy of study. Furthermore, it is not the same to receive a red card in a regular competition (like the most part of the leagues, with 38 matches) as in a knockout competition, such as the Europa League (with 11 matches from group stage until the final).

The main purpose of this paper is to analyse the influence of red cards on the development of the matches in the UEFA Europa League competition. To this end, we consider the research question: how does a player's expulsion affect the main performance indicators of the game? The answers to this question could offer interesting implications for coaches and teams to enable an advantage over rivals and maximize the opportunities to win this competition.

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The rest of the paper is organised as follows. In the next section, we introduce the literature review, Section 3 presents the data and the methodology; the results are presented and discussed in Section 4; and the final section concludes with the main implications.

2. Literature review

Football is a complex and multifaceted phenomenon. Several papers have analysed the performance and the main factors that impact the outcome in football. From the literature review we could sort out three main groups: (i) physical and physiological factors related with competition (Zubillaga, et al., 2009), (ii) psychological and contextual factors (Middlemas and Harwood, 2017), and (iii) specific factors about football, such as technique, tactics, and strategies (Carmichael et al., 2000; Oberstone, 2009).

The potential impact of red cards on match performance could affect three different dimensions. From one side, when a team plays in numerical inferiority it is supposed that ten players must to do the same work as the eleven from the opposite teams; so, physical and physiological factors could be affected, for example the running distance of the ten players team. From the other side, it is assumed that the team with eleven players must play better than the ten players team. This kind of liability is a psychological overweight from the eleven players team, and an extra motivation for the ten players team. These factors probably have an impact on the performance of both teams and consequently on the match outcome. Finally, to offset all kinds of red card consequences that impact on the game, the strategy must to be changed, and the tactics adapted.

The effects of red card on the overall performance of football teams have been previously analysed in the literature (Carmichael et al., 2000; Oberstone, 2009; Lago-Ballesteros and Lago-Peñas, 2010; Lago-Peñas, et al., 2010; Lago-Peñas and Lago-Ballesteros, 2010; Lago-Ballesteros and Lago-Peñas, 2011; Castellano, et al., 2012; Moura, et al., 2014; Cervený et al., 2018). For example, Ridder et al. (1994) were the first to specifically investigate the effects of a player's expulsion on the outcome of a match. They have found an statistically significant increase in the rate of scoring for the team with one more player, but they did not observe a significant decrease in this rate of the penalized team. However, more recent studies such as Vecer et al. (2009) and Greenberg (2015) have shown that the scoring intensity of the penalized team drops significantly, while the scoring intensity of the opposing team increases slightly. More recently, Cervený et al. (2018), analysing the World Cup football matches, show that the goal-scoring rate of the team with ten players goes down. Consequently, according to these authors, it is clearly better playing against ten players than to eleven players (Anderson and Sally, 2013).

On the other hand, according to other authors, playing with only ten players could not have such disadvantages. For example, Mechtel et al. (2011) have showed that sending-offs against home teams have a negative impact on their performance. However, for visiting teams, the impact depends on the time remaining after the red card and can be

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positive if the sending-off occurs late in the game. Thus, according to these authors, the “ten do it better” myth seems to hold for guest teams to a certain extent.

To sum up, in football there is no consensus about the impact of the red card on the game outcome and the tactics developed by the teams. Our contribution is to offer empirical evidence analysing the relationship of red cards with six variables: fouls, yellow cards, corners, shots on target, ball possession, and goal differences in one of the most famous knockout competitions in the world, the UEFA Europa League.

3. Competition, Data and Variables

Despised by a few, and increasingly acclaimed by more high level teams, the UEFA Europa League is one of the tournaments that has been gaining prestige in recent years. Changes in their different formats, the remodelling of the competition system, and the window to the Champions League and the European Super Cup have brightened up an increasingly interesting tournament. The format of this tournament is not simple, since it has several rounds. A total of 193 teams from different European countries participate, including Israel and Azerbaijan. To play the Europa League, the teams must achieve one of these objectives in the previous season: (i) to be champion of the cup of the different countries (or to be runner-up whenever the champion manages to qualify for the UEFA Champions League); (ii) the best classified of the national leagues, dispute the UEFA Champions League, and the following best qualifiers can access the Europa League ; (iii) the teams that qualify for the previous rounds of the UEFA Champions League and are defeated, will then access the Europa League.

This competition has four rounds prior to the group stage. Here, the importance of the league in which the team participates is also relevant, since the countries whose league is smaller, begin the competition in the prior first-round, and those of greater importance, are classified directly for the group stage or for the round before group stage. These previous rounds are disputed on a round-trip basis, where both teams play a match at home and other away. The group stage consists of 48 teams, which are divided into twelve groups of four teams each (144 matches). Teams from the same country cannot match in the draw in the same group, and in the draw the teams are divided into four drums, according to their previous appearances in the competition.

The two best teams in each group, 24 in total, pass to the round of 32. To complete the 32 teams, the 8 teams that have been in third position of their respective groups in the UEFA Champions League join this phase of the competition. From here, all rounds (31 matches) are disputed on a round-trip basis. Since the season of 1997/1998 the final is played in a neutral stadium, previously designated by UEFA.

Besides being the second most important international competition at European level, the UEFA Europa League also stands out for the prizes distributed according to the round that each team reaches. The maximum ceiling for the champion for the season 2017/18 is 15.71 million euros, which must be added to a variable amount of the market

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pool share. Since the season 2014/2015, the champion of this tournament directly accesses the group stage of the next Champions League edition, which makes this competition of greater interest from European teams, besides the considerable economic impact for the team that achieves this goal.

The data base is our own elaboration based on the UEFA official web site. Our analysis and data base are composed of all the matches in which a certain team with a red card has been sanctioned in the Europa League, in the five seasons, since the 2011/12 season to the 2015/16 season. The previous rounds before accessing the group stage have been dismissed, only using the group stage matches and the final phase playoffs. This means that we have analysed a total number of 200 matches.

In order to perform the analysis, firstly, we have specified if the team suffering sanctions through a red card is the local team or the visiting. The objective seems clear, since in the literature the idea is stressed that home teams had an advantage in relation to the visiting team, and here we seek to observe this relationship in the Europa League. The second step was to specify the minute that teams received the red card, because it is not the same to play 80 minutes against one more player, or to do it for only 5 minutes for example.

When analysing the data, we have checked that in some matches there was not only one red card. We have found two different situations; when both teams had a player sent off and both play with ten players, and the other situation is when the same team had another player sent off, so this team will play with nine players against eleven of the opponent team. To solve this small mismatch, only the actions in the variables after the initial expulsion, occurring during the period of numerical inferiority, have been counted. From the second expulsion, after which the two teams return to play with the same number of players, the actions that occur in this period were computed as before the expulsion. As the situation is similar to the initial one, this adjustment helps to overcome this problem.

Apart from the red cards, we have considered other disciplinary actions, such as yellow cards and fouls. These variables have been previously analysed to explain sport performance and the probability of victory (e.g., Anders and Rotthoff, 2011). We make the distinction between these disciplinary actions occurring before or after a player expulsion (red cards). Considering these actions previous to an expulsion, we would like to check if the team that has been punished with more yellow cards is more likely to receive the expulsion. We also specify the yellow cards and fouls for teams given an expulsion once during the match. With this approach, we are looking to analyse if the trend of the cards and fouls changes once the referee has sent off a player. This trend can change for several reasons, among those highlighted, a change in the behaviour of the players, or the change in the behaviour of the referee, because once a player is expelled, they can try to "compensate" the sanction subconsciously.

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To analyse the potential impact of the red card in tactics and play actions, we have considered two offensive actions: corners and shots on target. Again, for a better understanding, we have differentiated the shots on target and corners before and after the player expulsion. These two variables have been chosen to analyse the trend change, since these two variables can indicate offensive tendency of the team. In other words, to achieve a goal, it is necessary to attack, and these variables are widely used in the literature to analyse the offensive tendency of the teams (Carmihael, et al., 2000; Oberstone, 2009; Sala-Garrido, et al., 2009; Lago-Ballesteros and Lago-Peñas, 2010). It is expected that teams which have played part of the game with one more player present an offensive tendency, or at least after the sanction to the opposing team.

Also, we have selected the ball possession, specified in percentage, as a variable that reflects the play style of each team. This variable has been widely considered to explain the success of football teams (i.e., Gama, et al., 2016; Casal, et al., 2017). Unfortunately, and unlike in previous variables, we cannot differentiate ball possession percentage pre- and post-expulsion, although it might be expected that the moment in the match when the player is dismissed is directly associated with this variable. The available information offers only the percentage of the whole match. In this context, we have tried to overcome this problem by considering four differentiated periods of time during the match. In particular, we have established four phases: i) from the beginning of the game until the 30th minute; ii) from minutes 30 to 60; iii) from 60 to 85; and iv) from the 85th minute to the end. It should be highlighted that in general most of the expulsions occur at the end of the match, and so we have particularly considered the last five minutes of each match. Finally, it was not possible to obtain data from the seasons 2011/12 and 2012/13, so the analysis related with the ball possession comprises only the last 3 seasons of the sample.

Finally, it should be expected that if the red cards might be associated with the match outcome, this could be analysed by considering the difference in goals between the two teams playing the match. So, we define the goals difference as a ratio of the goals scored by the ten players team and the eleven players team (goal difference = 10 players team goals - 11 players team goals). Following the same approach as in the ball possession variable, we have considered the same periods of time during the match. Because of that, we have decided to analyse the difference of goals for periods of the match. Whether the goal difference is negative, implies that the ten player teams have achieved to score more goals than their opponents. If the ratio is zero, both teams scored the same number of goals or did not scored after the red card. When the ratio is positive, it means that the eleven players team have managed to impose in the part of the match where it offers a numerical advantage.

Table 1 describes the values of the variables under study before and after a player expulsion for each season.

Table 1. Descriptive statistics

	2011/12		2012/13		2013/14		2014/15		2015/16		Total	
	10	11	10	11	10	11	10	11	10	11	10	11
Fouls before	444	389	453	398	449	388	379	286	452	378	2177	1839
Fouls after	183	286	102	157	136	163	113	147	104	167	638	920
YC before	97	49	81	44	95	61	82	38	109	57	464	249
YC after	47	63	41	33	33	41	29	24	27	30	177	191
Corners before	144	126	112	113	122	172	142	118	142	167	662	696
Corners after	53	118	31	82	25	83	24	63	21	68	154	414
Shots on target before	308	327	304	291	285	372	285	295	343	343	1525	1628
Shots on target after	147	277	85	218	81	264	68	210	50	237	431	1206
Ball Possession (%)	---	---	---	---	41.8	58.2	49.2	50.8	46.5	53.5	45.8	54.2
Goals after	17	43	10	20	11	29	12	32	9	30	59	154

Note: 10=10 players team; 11=11 players team; YC= yellow card; --- = unavailable data

4. Results

There has been a total of 200 matches in which there is an expulsion in the eliminatory stage of the competition, affecting a total of 66 teams. Forty teams that have suffered the expulsion, did not achieve the objective of qualifying for the next round, while 26 were able to overcome the expulsion and pass to the next round even with the red card handicap. To sum up this initial analysis: 60% of the teams that received a red card were eliminated in a knockout against the 40% that qualify.

The traditional “away team” effect is checked. We ascertain that playing at home and away is closely related to the number of red cards. Out of the 200 expulsions, 130 (65%) that have occurred during the last seasons in the Europa League have been sanctioned to the visiting team, and 70 (35%) have been received by the home team. So, visiting teams has played 60 out of 200 matches more than the home teams in numerical inferiority.

In order to analyse the effect of the red cards on match performance, we start our analysis by considering the disciplinary actions (fouls and yellow cards) before and after the player expulsion. In Figure 1 we can observe the total fouls and yellow cards before and after a team receive the red card. Both the fouls and the yellow cards were mostly for the teams that will have a player sent off (called the ten players team). After the red card, there is a clear change in the behaviour of these two disciplinary actions; both fouls and yellow cards now occur more than the half of the time from the eleven players team. These changes could be explained by different factors, such as the changes in the tactics developed by both teams or in the decisions of the referees after a player expulsion (conditioned by the home crowd).

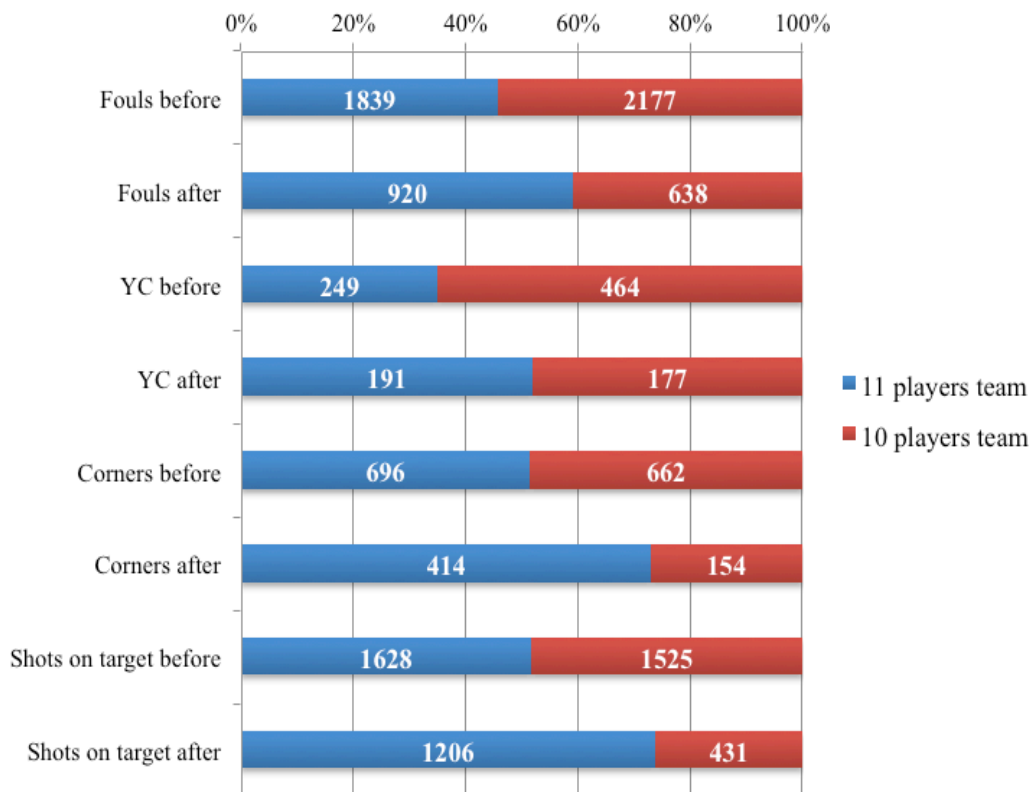


Figure 1. Disciplinary and offensive actions before and after the red card

In this regard, the behaviour of the performance indicators that represent the offensive actions accomplished by the teams will help to understand the main causes of the changes observed through the disciplinary actions. As observed in Figure 1, the corners and the shots on target before the red card are quite balanced between the teams. However, after the red card, they have increased considerably for the eleven players team. These findings first of all remark the impact of playing with one player less in a football match.

On the other hand, it can be assumed that playing with one player less might affect the ball possession of the teams involved in the match, reducing this percentage to the team with a player less. This effect might be moderated for the moment in which the expulsion happens, and so we have defined four periods during the match.

As shown in the Figure 2, the team that has played part of the match with one more player has a higher percentage of ball possession than the opponent. The average percentage of ball possession of the team with one more player tends to decrease as more minutes pass before the red card. When the sending off occurs in the final moments of the match the percentages tend to be similar.

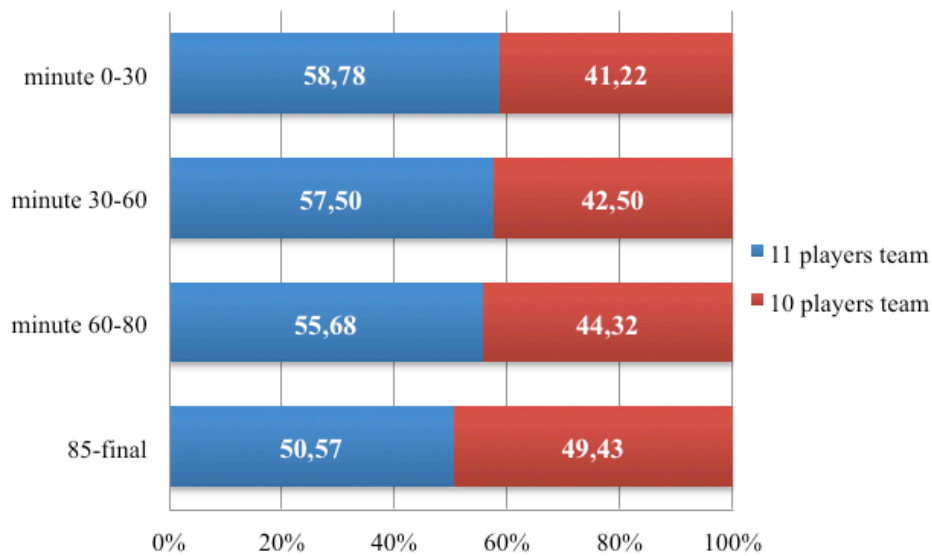


Figure 2. Ball possession regarding red card time

Finally, the last variable observed is the goals. Our focus is not the total number of goals scored by the teams, but the goal difference of the team that plays with fewer players for part of the match. Then, we only observed the goal difference produced after the red card.

Initially it should be expected that the goal difference between both teams will be greater when the expulsion occurs in the first moments of the match, and that an expulsion in the final minutes may be insignificant in the results. As we can observe in Figure 3, for all the periods of time under study, we have obtained a positive difference. This means that the eleven players teams score comparatively more goals than the ten players teams.

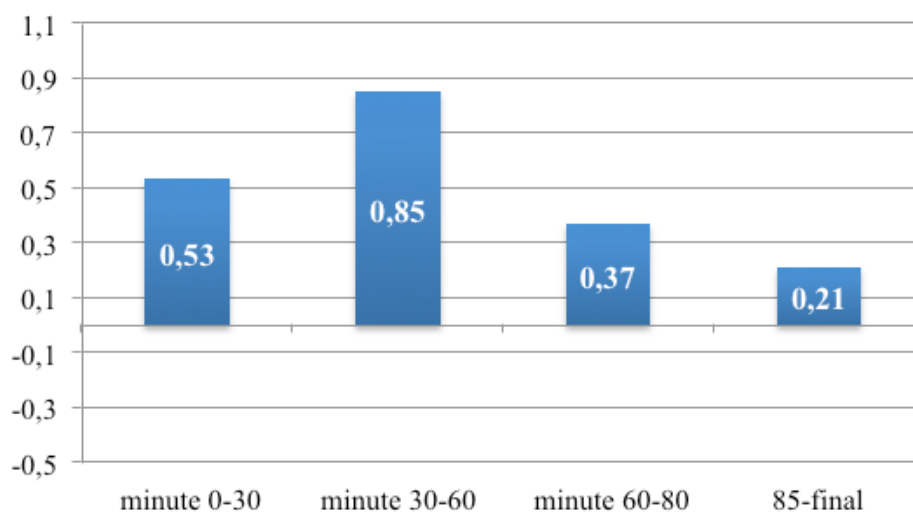


Figure 3. Goal difference between 11 players teams and 10 players teams regarding red card time

It might be expected that this difference could decrease over time because the teams with numeric superiority should have less opportunities to score goals as time passes.

Unexpectedly, this argument cannot be confirmed with our data, but we obtain evidence that during the last part of the match, the superiority in player numbers is less relevant. When the red card happens between minute 30 and minute 60, the likelihood of scoring a goal by the team with eleven players increases until a ratio of 0.85. Also, the majority of red cards are for the away teams, with the likelihood of red cards for home team being statistically significantly less. Consequently, this is another factor to explain why home teams traditionally show a greater probability to win and score goals than the away teams.

Finally, as can be observed in Table 2, we show the correlation between the fouls, yellow cards, corners, shots on target, goals, and goal difference with the minute when the player is dismissed (RC Min). We make the distinction between the team with ten players and the team with eleven players. In Table 2, the correlations among goals and the period of the match that a player is dismissed are significant and negative. These results mean that the later the player is sent off, the less goals the teams will score.

Table 2. Correlations between variables under study and the red card minute

		RC Min	Goals 10	Goals 11	Goals Diff.
RC Min	Pearson Correlation	1	-,385**	-,438**	-,173*
	Sig. (2-tailed)		,000	,000	,014
	N	200	200	200	200
		YC B10	YC B11	YC A10	YC A11
RC Min	Pearson Correlation	,412**	,404**	-,521**	-,497**
	Sig. (2-tailed)	,000	,000	,000	,000
	N	200	200	200	200
		Fouls B10	Fouls B11	Fouls A10	Fouls A11
RC Min	Pearson Correlation	,616**	,658**	-,754**	-,789**
	Sig. (2-tailed)	,000	,000	,000	,000
	N	200	200	200	200
		Shots B10	Shots B11	Shots A10	Shots A11
RC Min	Pearson Correlation	,594**	,587**	-,591**	-,749**
	Sig. (2-tailed)	,000	,000	,000	,000
	N	200	200	200	200
		Corners B10	Corners B11	Corners A10	Corners A11
RC Min	Pearson Correlation	,355**	,424**	-,546**	-,617**
	Sig. (2-tailed)	,000	,000	,000	,000
	N	200	200	200	200

Notes: RC Min= red card minute; 10= 10 players team; 11= 11players team; Goals Diff. = The difference of goals between 10 players team and 11 players team; YC= yellow card; B= before; A= after; Shots= shots on target. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

5. Conclusions and implications

In this paper, we have analysed the relationship of a red card in the match outcome with some performance indicators associated with sport tactics developed during the match.

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In particular, we have analysed 200 matches in which at least one player was dismissed during the game in five seasons of the UEFA Europa League, between seasons 2011/12 and 2015/16. Our results show that when a team suffers an expulsion in the final phase of the UEFA Europa League, 60% of the time it was eliminated, only 40% of them reaches the next round of the competition. These results confirm the lack of validity of the “red car cliché”, described by Mechtel et al. (2011) and show that playing with eleven players is ever better than playing with ten in order to win a match, confirming evidence shown, among others, by Vecer et al. (2009), Anderson and Sally (2013), Greenberg (2015) and Cervený et al. (2018). Also, our results confirm the idea that the team that plays the match in its home stadium starts with a slight advantage. From all the red cards showed in this competition 65% were to the visiting team. The local team receives this sanction only 35% of the time.

65.07% of the yellow cards prior to an expulsion are received by the team that will subsequently be sanctioned with an expulsion, compared to 34.93% of the opponent. This is an expected result because the team that receives the most yellow cards is more likely to receive a red card because the accumulation of two yellow cards in a match implies the expulsion.

The percentage of yellow cards before a red card has been shown to be similar for both teams, with 48% for the team that has been left with one less player, and 52% for the team that plays with eleven players. Also, there is a change in the tendency of the yellow cards after the expulsion, since it goes from 65% prior to the expulsion to 48% for the team with a red card. Similarly, it seems that after the expulsion of one player, the distribution of the faults between both teams changes. The 59.05% of fouls that the referee indicates after an expulsion are for the team that plays with eleven players, being less permissive in the actions they perform. The 40.95% of the fouls are sanctioned to the team that plays with one player less, a percentage significantly lower than the 54.2% of fouls that were sanctioned to the same team before the expulsion. This result might be associated with the so-called “referee bias”, that previous empirical evidence has shown (Dawson, et al., 2007; Boyko, et al., 2007; Buraimo, et al., 2010; Buraimo, et al., 2012; Goumas, 2014).

The playing style and tactics of the teams are altered after the sending-off of a player. The team playing with one more player, passes to attack more intently. This fact is reflected in the percentage of shots on target and corners after an expulsion. 73% of these offensive actions are carried out by the team that plays with one more player. The percentage prior to the expulsion is very close to 50%. Also, the ball possession is influenced by the player expulsion, even making distinction for the moment of the expulsion. When the expulsion occurs at the beginning of the match, the average ball possession of the team that plays with one more player will be higher. For example, when the expulsion occurs between minute 0 and 30, the average possession percentage of the team playing with 11 players is 58.78%; decreasing to 57.5% when it occurs between the 30th and 60th minute; 55.68% between minutes 60-85 and decreasing

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drastically to 50.57% when it is in the final moments. The expected negative trend is confirmed, reaching values close to but slightly above 50%.

Finally, the presence of red cards in the UEFA Europa league matches is directly related with the goals during the matches. According to our results, it is possible to affirm that the team that plays part of the match with one more player, manages to score more goals than its rival. Regardless of when the expulsion happens, we can say that the eleven players team had a significant advantage in relation to the ten players team. Furthermore, the difference of goals between the team that plays with ten and with eleven for part of the match will be greater when the expulsion occurs earlier in the match. This result confirms previous empirical evidence for the World Cup football matches (Cervený et al., 2018).

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