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Ball Recovery Consistency as a Performance Indicator in Elite Soccer

Consistência na recuperação da bola como indicador de desempenho no futebol

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Abstract – In soccer, an attack begins with ball recovery. Therefore, the consistency of this performance indicator during a match and its balanced distribution in the field zones can be one of the distinct characteristics of successful soccer teams. This study aims to investigate the performance consistency of ball recovery during a match within several time periods (6 periods of 15 min) and zones (four zones). To this end, observational methodology and software Focus X2 were adopted to evaluate 28 matches of semi-final teams at FIFA 2014 including Germany, Argentina, Netherlands, and Brazil in terms of ball recovery frequency. In total, 3222 performances were recorded. All teams in each match and in whole competition had homogeneity of distribution of ball recovery during the time periods (χ^2_3=1.597, p=0.66). The results of time-zone evaluation indicated that Netherlands and Brazil teams did not have performance consistency on all field zones (χ^2_{15}=31.29, p=0.008 and χ^2_{15}=37.53, p=0.001, respectively). Most ball recoveries were made in the defensive and middle-defensive zones in accordance with modern soccer. It was found that for a soccer team to be successful, it requires a space distribution of experienced players in the field, which leads to power balance for redesigning a team to be offensive in all zones.

Key words: Soccer; Sports; Time.

Resumo – *No futebol, um ataque começa com recuperação de bola. Por isso, a consistência desse indicador de desempenho pode ser uma das características distintas para o sucesso das equipes de futebol. Este estudo tem como objetivo investigar a consistência da recuperação da bola no desempenho durante um jogo dentro de vários períodos de tempo (6 períodos de 15 min) e zonas (quatro zonas). Empegou-se o software Focus X2 para avaliar 28 partidas das equipes que chegaram às semifinais do mundial da FIFA de 2014 (Alemanha, Argentina, Holanda e Brasil) em termos de frequência de recuperação de bola. No total, foram registados 3,222 desempenhos. Todas as equipes em cada jogo e em toda competição teve a homogeneidade da distribuição de recuperação de bola durante os períodos de tempo ($\chi^2$3 = 1.597, p = 0,66). Os resultados indicaram que as equipes da Holanda e do Brasil não tinham consistência de desempenho em todas as zonas de campo ($\chi^2$15 = 31,29, p = 0,008 e $\chi^2$15 = 37,53, p = 0,001, respectivamente). A maioria das recuperações de bola foi feita na zona defensiva e na zona meio-defensivo. Verificou-se que para um time de futebol ser bem sucedido é necessário distribuição espacial dos jogadores mais experientes no campo, o que leva ao equilíbrio da equipe para ser ofensivo em todas as zonas.*

Palavras-chave: *Esportes; Futebol; Tempo.*

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INTRODUCTION

Sports analysts regard the success of the world's elite soccer teams as reliant on ball recovery[1] and essential strategies to maintain ball possession[2-4]. This index plays an important role in the defensive as well as first stage of attack, and most chances of goals at 2010 World Cup were related to ball recovery in the middle-defense zone[4]. This indicates the importance of middle and defensive player performance in the success of international soccer teams.

Success in soccer requires performance consistency and continuous team effort during time intervals of the match. One of the reasons of teams' success lies in the implementation of stable behavior during the match as well as maintaining the offensive stream, irrespective of the playing style, competition stage, and score line in progress[2,4,5]. Players of such teams do not wait for the opponents to make a mistake so as to take advantage of the turnovers, but rather continuously maintain the attack flow through direct ball recovery such as interception and tackle[1,6]. Therefore, one of the indicators of success in elite soccer involves a variety of behaviors for ball recovery and the zones where such behaviors are performed[2-4], because such behaviors constitute the basis of any attack linked with the success of teams. Previous studies have shown that the majority of ball recoveries in World Cups 1982 and 1990 occurred from the defensive zone, in European Clubs from the midfield zone[7], in Euro 1996 from the offensive zone[8], in the World Cup 1998 from the mid-defensive zone[9], at the World Cup 2002 from the mid-defensive zone[10], at the World Cup 2010 from the defensive and mid-defensive zones[4], and in European Champions League 2012-13 from the defensive zone[11]. Similarly, at the World Cup 1994, there were different ball recovery patterns that made successful teams adopt different playing styles[12]. Hence, ball recovery zone is a situational variable affecting match results[11].

Analysts mainly focus on the frequency of events and analysis based on descriptive statistics such as frequency, percentage, mean comparisons, regression models, discrimination and sequential analysis so as to determine ball recovery and its relation to attacking behavior in a competition season or tournament[4,11,13-15]. Such methods may suggest a suitable factor for successful performances in which time and space patterns for team performance indicators can be deduced. Although reports on the frequency of performance indicators can provide valuable information to coaches and players, there should be more in-depth analyses clarifying the invisible information on match performances. Consistency and flow of team behavior over time and zones is a useful information. Little attention has been paid to the time analysis of performance indicators for offensive behaviors in soccer. Nevertheless, the consistency of events leading to attack plays an important role in regulating the game flow and team results[13]. Analysis of defensive and offensive related indicators in teams that qualified for the quarter-final stage at Euro 2012 also showed that only Spain and Italy teams (tournament finalists) managed to maintain consistency of performance throughout the tournament. Generally, the most important factor that

contributed to Spain winning the Championship was their performance consistency across all matches[14].

The only study on the consistency of performance indicators was conducted to assess time consistency of soccer performance indicators[15]. Time series and statistical methods such as autocorrelation and cross-correlation were employed to analyze match consistency and its relation with match results in 16 defensive, offensive, and goal-related performance indicators in eight teams that qualified for the quarter-final stage of Euro 2012. The autocorrelation analysis revealed that Spain and Italy (finalists) had the highest performance consistency over consecutive matches compared to other teams. The cross-correlation analysis revealed that the highest relationship between goal-related parameters and match result was in Spain and France teams. With regard to offensive related indicators, France, England, Portugal, Greece, Czech, and Spain performed better. Moreover, France, England, Greece, and Portugal performed better in defensive related indicators. Overall, successful teams in international soccer tournaments tended to have higher performance consistency than any other team in consecutive matches[18]. However, the results have not been conclusive if such situations would determine the success of teams in other international tournaments.

World Cups are interesting events in the field of match analysis in terms of quality of opponents, match physical demands, frequency of matches, and time limitation, which are different from domestic leagues in any country and even continental tournaments[4,15,16]. Due to the complexity of soccer and the effects of situational parameters such as match location, quality of opponents, and match status on performance[9,17,18], explorations have been carried out on the consistency of ball recovery as the success factor of elite soccer teams and the identification of zone pattern of ball recovery which play significant roles in designing the offensive event. Although consistency of different performance indicators[15] as well as ball recovery performance in different zones of the field have been studied, there has not been any literature on comparing the performance indicators of teams over time periods and within both time and zone aspects. Hence, the current study set to evaluate the performance consistency of ball recovery in successful teams at the World Cup 2014 during 15-minute periods of the matches. Although previous studies focused only on ball recovery in different zones[4,12,13,19], here, the relationship between ball recovery time and zone in premier soccer teams at the World Cup 2014 was investigated.

METHODOLOGICAL PROCEDURES

The study followed observational approach and adopted digital recording techniques as well as computer analysis for evaluating the results. Based on the nature of samples analysis, the number of matches to be assessed was determined in terms of performance indicators[20]. Therefore, due to limitations of the World Cup 2014 Brazil, only the performances of teams

that qualified for the semi-finals including Germany, Argentina, the Netherlands, and Brazil were studied. The analysis covered 28 games (each team seven matches) of 64 matches throughout the tournament. Since the match results were not considered as dependent variable, the teams were equalized through examining only 90-minute periods of four World Cup successful teams while the extra times were excluded from the analysis. The videotapes of each game were recorded to be analyzed.

Data collection instrument

The sport behaviors of teams were observed and recorded by the software Focus X2 (Elite Sport Analysis, Delgaty Bay, Scotland). The software can record the frequency of performances based on defined criteria. The common soccer recoveries include: tackle, interception, goalkeeper save, set play, and turnover won across four field zones (defensive, mid-defensive, mid-offensive, and offensive)[9], over six 15-min periods covered the first 15 min until the sixth 15-min periods recorded by the software. Computer keyboard was used to record the observations. This software is capable of repeating scenes and displaying slow motion. Observations were recorded by an expert specialized in observational analysis and familiar with the software. Thereafter, the data were recorded and analyzed by Microsoft Excel 2010 and SPSS 19.

Statistical analysis

Descriptive statistics and contingency tables were employed in assessing the distribution of ball recovery over six-time intervals in the tournament and various zones. Teams performance consistency of ball recovery was examined over 15-min courses per match. Moreover, the performance in different zones was tested through χ^2 independence, homogeneity and Kruskal-Wallis. The significance level was considered 0.05.

RESULTS

In all 28 matches, the successful World Cup teams recorded a total of 3222 ball recoveries, with Brazil recording 821 and the Netherlands 763. Table 1 illustrates the overall performance statistics of the teams during the 15-min periods of the matches throughout the tournament. The mean frequency of ball recovery within every 15-min in each four zones of Germany, Argentina, the Netherlands, and Brazil were 4.87, 4.87, 4.54, and 4.89, respectively.

Assuming the frequency of ball recovery as random, the Kruskal-Wallis test revealed that the concentration parameter of the four teams had no significant difference, that is, they had similar performance in terms of the frequency of ball recovery, hence, equally distributed for the four teams (χ^2_3=1.597, p=0.66).

Comparison of team performances during the World Cup 2014 indicated that there was no significant difference between ball recovery

distribution over 15-min periods and the first and second halves of the matches. In other words, homogeneity of ball recovery distribution during the game reflects the consistency of team performances (Table 2).

Table 1. Ball recovery of the four teams qualified at the World Cup semi-finals 2014 sorted by time and matches

	Matches	Time Intervals								Time Intervals						
		15	30	45	60	75	90	Total		15	30	45	60	75	90	Total
Germany	First	18	20	14	13	14	14	93	Argentina	18	17	17	22	17	21	112
	Second	19	22	18	20	17	26	122		18	24	19	20	13	23	117
	Third	20	15	23	15	17	16	106		19	14	18	25	18	19	113
	Fourth	25	22	23	21	20	27	138		21	18	16	24	24	27	130
	Fifth	23	20	16	18	20	32	129		18	15	18	22	21	28	122
	Sixth	23	18	26	17	13	17	114		16	17	17	16	17	20	103
	Seventh	22	18	21	19	15	22	117		19	18	24	17	18	26	122
	Total	150	135	141	123	116	154	819		129	123	129	146	128	164	819
		15	30	45	60	75	90	Total		15	30	45	60	75	90	Total
Netherland	First	21	13	18	17	12	23	104	Brazil	26	22	21	21	16	17	123
	Second	16	19	17	23	19	13	107		23	14	23	23	15	22	120
	Third	15	18	14	16	16	29	108		17	16	18	20	26	19	116
	Fourth	20	18	10	21	20	26	115		17	19	25	21	21	22	125
	Fifth	21	17	20	22	19	25	124		21	26	13	16	15	15	106
	Sixth	15	10	21	18	11	24	99		24	21	17	23	19	14	118
	Seventh	17	17	18	21	15	18	106		20	17	15	20	21	20	113
	Total	125	112	118	138	112	158	763		148	135	132	144	133	129	821

Table 2. Results of homogeneity test χ^2 between the six time periods and match halves for the teams qualified at semi-finals of World Cup 2014

	15 min. intervals[1]		Halves[2]	
	X^2	p	X^2	p
Germany	15.83	0.98	5.74	0.45
Argentina	12.94	0.99	4.35	0.63
Netherland	23.01	0.81	2.42	0.88
Brazil	22.81	0.82	6.34	0.38

An examination of where ball recoveries occurred at the World Cup 2014, revealed that most performances belonged to the defensive and mid-defensive zones (Figure 1).

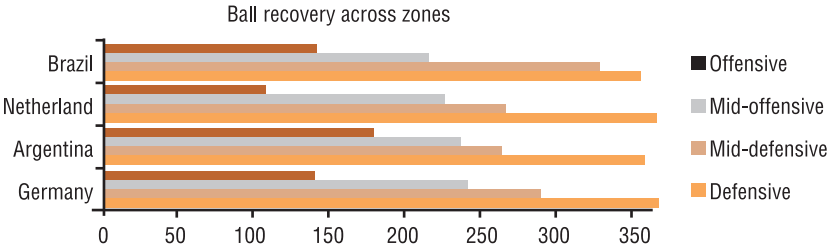
In examining the relationship between zone and ball recovery time, Chi-Square test for independence revealed that the two variables in the Netherlands and Brazil were statistically correlated (χ^2_{15}=31.29, p =0.008 and χ^2_{15}=37.53, p =0.001, respectively). According to the Cramers's V, the degree of correlation between the two variables in the Netherlands and Brazil were 0.117 and 0.123, respectively (Table 3). According to Table 4, based on independence hypothesis, the difference between the observed and expected values for the Netherlands and Brazil across the four field zones over the 15-min periods was enough to reject the hypothesis of statistical independence of time and zone in the ball recovery distribution.

Table 3. Results of independence test χ^2 between the match time and the field zones for four teams qualified at semi-finals of the World Cup 2014

Teams	X^2	P[1]	Cramer's v
Germany	17.12	0.31	0.083
Argentina	14.58	0.48	0.077
Netherland	31.29	0.008	0.117
Brazil	37.53	0.001	0.123

Table 4. Ball recovery of the teams qualified at the World Cup semi-finals 2014 in field zones

Teams				Time Intervals						Total
				15 Min	30 Min	45 Min	60 Min	75 Min	90 Min	
Germany	Zone	Defensive	Count	45	41	48	52	46	58	290
			Expected Count	53.1	47.8	49.9	43.6	41.1	54.5	290.0
		Mid-defensive	Count	45	48	38	26	29	42	228
			Expected Count	41.8	37.6	39.3	34.2	32.3	42.9	228.0
		Mid-offensive	Count	35	34	34	29	29	29	190
			Expected Count	34.8	31.3	32.7	28.5	26.9	35.7	190.0
		Offensive	Count	25	12	21	16	12	25	111
			Expected Count	20.3	18.3	19.1	16.7	15.7	20.9	111.0
		Total	Count	150	135	141	123	116	154	819
Argentina	Zone	Defensive	Count	41	39	44	45	47	67	283
			Expected Count	44.6	42.5	44.6	50.4	44.2	56.7	283.0
		Mid-defensive	Count	36	38	35	37	24	38	208
			Expected Count	32.8	31.2	32.8	37.1	32.5	41.7	208.0
		Mid-offensive	Count	36	23	26	37	31	34	187
			Expected Count	29.5	28.1	29.5	33.3	29.2	37.4	187.0
		Offensive	Count	16	23	24	27	26	25	141
			Expected Count	22.2	21.2	22.2	25.1	22.0	28.2	141.0
		Total	Count	129	123	129	146	128	164	819
Netherland	Zone	Defensive	Count	58	44	42	48	41	56	289
			Expected Count	47.3	42.4	44.7	52.3	42.4	59.8	289.0
		Mid-defensive	Count	30	42	30	33	30	45	210
			Expected Count	34.4	30.8	32.5	38.0	30.8	43.5	210.0
		Mid-offensive	Count	30	21	31	43	21	32	178
			Expected Count	29.2	26.1	27.5	32.2	26.1	36.9	178.0
		Offensive	Count	7	5	15	14	20	25	86
			Expected Count	14.1	12.6	13.3	15.6	12.6	17.8	86.0
		Total	Count	125	112	118	138	112	158	763
Brazil	Zone	Defensive	Count	39	35	48	42	54	63	281
			Expected Count	50.7	46.2	45.2	49.3	45.5	44.2	281.0
		Mid-defensive	Count	60	44	31	48	36	40	259
			Expected Count	46.7	42.6	41.6	45.4	42.0	40.7	259.0
		Mid-offensive	Count	29	36	29	35	27	14	170
			Expected Count	30.6	28.0	27.3	29.8	27.5	26.7	170.0
		Offensive	Count	20	20	24	19	16	12	111
			Expected Count	20.0	18.3	17.8	19.5	18.0	17.4	111.0
		Total	Count	148	135	132	144	133	129	821



	Germany	Argentina	Netherland	Brazil
Offensive	111	141	86	111
Mid-offensive	190	187	178	170
Mid-defensive	228	208	210	259
Defensive	290	283	289	281

Figure 1. Distribution of ball recovery in field zones

DISCUSSION

The primary objective of this study was to identify the patterns of ball recovery adopted by successful teams at 2014 World Cup. In fact, this study sought to detect the performance consistency of ball recovery in world elite soccer teams and introduce it as an indicator of the team success. To this end, the ball recovery frequency of each team was assessed over the 15-min courses in different field zones. Given that four teams of Germany, Argentina, the Netherlands, and Brazil had equal greatest frequency of matches, it was impractical to compare them with other teams. Hence, the performances of the four teams were evaluated as successful performances.

Results showed that the ball recovery performances of teams at semi-finals of the World Cup 2014 over the 15-min course as well as the first and second halves in individual games and the whole competition were not significantly different. Furthermore, performance of the four teams in terms of ball recovery was equal (χ^2_3=1.597, p=0.66). These findings are consistent with those on the success of teams at the World Cup 2010[4]. They also observed that the frequency of attacks carried out by teams in each match and the entire tournament was not significantly different, indicative of the consistency of team performance. In other words, the successful teams, regardless of the earned rank, maintained a stable rate of ball possession, which can be an indicator of success. In examining the soccer teams in Euro 2012, in which the finalists (Spain and Italy) had the greatest performance consistency during the tournament in the goal, defensive, and offensive related indicators[15], it was concluded that teams' success in international soccer depends on the consistency and stability of high-level performance, rather than good performance in one or more individual games. Analyzing the scored goals at three World Cups 1998, 2002, and 2006, revealed that in the 1998 and 2002 World Cups, most goals were scored in the second half, however, in FIFA 2006, there was no significant difference between the two halves[21]. Although this study did not focus on the scored goals, the comparison with the three World Cups revealed that coaches had found out, throughout the development of soccer, that the success of the sports

teams is not only linked with technical and physical capabilities[22,23], but also with performance consistency over both halftimes. Thus, there would be no difference between the first and second halves. Coaches believe that ball recovery methods and strategies as connectors between the three most important moments of defense, transition, and offense are the most developed aspects of modern soccer[24]. Hence, maintaining the rhythm and flow of such behavior would help the team dominate the match.

Distribution and positioning of the players on the field is a key performance indicator to assess the tactical behavior[25]. This refers to the principle of space distribution[26,27] where the zone covered by each player in the length and width of the field can provide useful information on strategic decision making. Stability and consistency of ball recovery performance in the successful FIFA 2014 teams during various stages of the tournament and match time periods are associated with the arrangement of players by the coach and their space distribution. It is recommended that future studies focus on the relationship between space distribution and ball recovery performance factors in successful and unsuccessful teams.

When the assumption of independence between time periods and field zones was evaluated, the results for the Netherlands and Brazil were significant (X^2_{15}=31.29, p=0.008, Cramer's V=0.117 andX^2_{15}=37.53, p=0.001, Cramer's V=0.123, respectively). This means that certain times of the games played by the two teams involved more ball recovery and occurred in one zone as compared to others, suggesting that ball recovery of the two teams in different field zones over the match time was not consistent and stable. Both teams had the weakest ball recovery performance in the offensive zone, although the Netherlands had theirs in the first and second 15-min periods (first half) while that of Brazil was in the fifth and sixth 15-min periods (second half) (Table 4). Although all four teams in the semi-finals of the FIFA 2014 tournament showed stability and consistency of performance in whole competitions, the separation of team performance in different zones revealed that the ball recovery performance of the Netherlands and Brazil in the offensive zone was weaker than other teams, indicating an imbalance in the team power in four zones of the field. Although this study overlooked the effect of factors such as opponent quality and competition stage[4], it appears that lack of equal distribution of elite players in different positions in Netherlands and Brazil teams, due to difference in fitness level and technical readiness of players[23,24], led to lack of integrative occurrence of the ball recovery and transition process of defense to offense over time. In confirmation of this, researchers observed that, regarding the failure of teams that could not qualify for the final of EURO 2012, other teams compared with the finalists Spain and Italy performed poorly and inconsistently with respect to the offensive and defensive indicators[15].

From the analysis, most of the World Cup 2014 ball recoveries occurred in defensive and mid-defensive zones, and were consistent with the World Cup 2010[4] and UEFA 2011-12[9]. Examination of the domestic leagues in Norway[13] and Spain[12] confirm the results. In modern soccer, each offense

is initially designed at the midfield and defensive lines, where the offense can be supported by an actively defensive organization[26]. According to the concentration principle[27], when the team is in search of ball recovery, it actually falls in the defensive phase. In such a situation, the teammates pull together and protect the midfield zone. Hence, the main objective of any defensive action is to reduce the instability of the team in the key and sensitive zones[28]. In other words, there should be a greater degree of ball recovery performance in the midfield zone. Thus, awareness of where the most effective ball recovery occurs in the field plays an important role in understanding the patterns of offense and improving the coach training sessions. A review of the World Cup 1998[29] and the top teams in Europe[30], revealed that most ball recoveries leading to goal chances were initiated from the offensive zone. This contradiction may be due to differences in the ability and tactics of teams in different tournaments.

CONCLUSIONS

The present study thus showed that consistency of ball recovery performance during time periods of a match and the whole tournament is one of the indicators of success in the World Cup teams. However, this factor can guarantee team success only when it is distributed across the entire field zones. This requires space distribution of experienced players on the field, leading to balance of power in all zones so as to redesign an offense. Following the concentration principle and designing of attacks from the midfield zones helps to improve the soccer team productivity. Overall, this study revealed that performance consistency in soccer teams can be an ideal factor that differentiates successful teams.

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