



Statistical Analysis of Soccer Game

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국문초록

본 연구의 목적은 2002년 한·일 월드컵에서 우승을 차지한 브라질의 7경기를 대상으로 축구 경기를 분석하는 것이다. 본 연구에 사용된 경기 분석용 비디오테이프는 FIFA에서 인정한 공식 중계방송사인 한국방송공사(KBS)의 중계 자료를 사용하였다. 본 연구의 통계 처리는 SPSS 프로그램을 이용하여 상관관계분석(Pearson Correlation)을 실시하였다. 본 연구를 통한 결론은 다음과 같다. 첫째, 브라질 팀은 득점할 수 있는 비율이 높은 수비에서 최종공격수로 바로 연결되는 역습에 의한 공격(20.0%), 미드필드를 통한 빠른 공격(20.0%), 세트 플레이에 의한 공격(18.5%), 공격지역에서 볼을 뺏은 후 공격(18.5%)으로 다양한 공격 전술을 구사하여 상대 팀보다 많은 득점기회를 얻었다. 둘째, 브라질 팀은 골키퍼를 제외한 전 선수의 볼 소유 횟수가 비슷하게 나타나서, 전 선수가 고르게 활약했다. 경기의 질을 나타내는 지수인 인덱스에서는 수비수 중에는 중앙 수비수가 3.3, 미드필더 중에는 왼쪽 중앙 미드필더가 5.0, 공격수 중에는 중앙 공격수가 1.4로 포지션별로 제일 높게 나타나서 경기에서 중요한 역할을 수행하였다. 셋째, 브라질 팀은 세트플레이 성공률과 공격지역에서의 볼 점유율의 증가를 통하여 골당공격성공률을 높인 것으로 나타났다.

KEYWORDS : SOCCER, BALL POSSESSION NUMBERS, INDEX

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I. Introduction

Soccer is the most popular sports in world. World cup is the most tremendous and exciting game even though to the hosts it is only a soccer game. All countries that belong to the FIFA wish, hopefully that they could be into final match. It is necessary to improve game ability throughout not only scientific teaching to each athlete and whole team but also supporting by a nation and by a people.

Past soccer games was more dependent on the experience of a coach rather than scientific analysis based on the soccer data from the previous matchs (Franks & Hughes, 1997). Recently, it has tried to analyze soccer games using computer program (Chae, et al., 2001; Kim & Lee, 2003; Franks & Hughes, 1997). The soccer game analysis program using computer is simultaneously capable of inputting, analyzing, and determining data during the game. It has a strong advantages of a developing a model, which predicts future results throughout constructed database (Kim & Lee, 2003; Franks & Hughes, 1997).

The most important point of a computer analysis program is what that program is made out of. However, a previous developed program is limited to contain either the basic statistical data such as the number of successful pass and shooting or the visual data such as the ratio of leading attack and patterns during attack and defense.

Brazil soccer team was a winner of the Korea · Japan World Cup in 2002. It is important to analysis of factors such as success and allowance factors in a score, characteristics of the attack in score opportunities, ball possession numbers and index and statistical analysis in soccer game of Brazil team.

The purpose of this study is to analyze seven soccer games which played by Brazil team using statistical analysis. Thus results of this research may provide understanding of strong and weak points of athletes, performance enhancement during attack and defense, and also able to give effective information to athletes and coaches.

II. Methods

1. Numbers of analyzed team

Seven games played by Brazil team were analyzed.

2. Procedure

Screening seven games recorded by KBS, which is official broadcasting company approved by FIFA were used. Through the recorded video tape, frequency analysis was performed. Pearson Correlation was employed for selected variables with using SPSS program (Version 10.0).

3. Recording and analyzing instrument

Three recording advice (SV-S220×2, Samsung; WV-DR7×1, Sony), an analyzing device (GVR-S955, Sanyo) and a monitor (PVM-1351Q, Sony) were used.

4. Definition of terms

- (1) Index: defines that adding point during attack and defense divided by subtracting point during attack and defense. It indicates qualitative performance (Reilly & Thomas, 1997).
- (2) Adding point during defense: defines a strong play such as discontinuing pass, delaying attack of an opponent player using tackle technique and stealing the ball.
- (3) Adding point during attack: defines a strong play such as a great pass, breaking through the opponent's line, and good control of the ball continued by shooting.
- (4) Subtracting point during defense: defines a weak play such as a defense play broken through by the opponent player, choosing improper location, and fail in marking players, and wrong decision making under the circumstances.
- (5) Subtracting point during attack: defines a weak play such as an improper dribble and wrong pass, ball stolen or miss control, and wrong decision making under the circumstances.
- (6) Score opportunities: In case that the attacker and the goal keeper are standing against each other and if there are not the mistake of the attacker or the perfect play of the offender, that was the determinant chance for adding the score.

III. Results and Discussions

1. Scoring analysis values

The scoring analysis values are in Table 1. Brazil team showed lower ratio of the number of attacks per goal (3.61 vs. 12.75) and higher percentage of successful attack rate per goal compared to opponent team (27.69% vs. 7.84%). Brazil team showed relatively lower number of attacks per goal than Norway team (4.7), and the successful attack rate per goal of Brazil team was higher than those of Norway team analyzed 44 game from 1991 to 1994 (21.4%) (Reilly & Thomas, 1997).

Brazil team showed higher average scores than an opponent team (2.57 vs. 0.57). The average score of both teams was 3.14. It was higher than that in Korea · Japan World Cup in 2002 (2.52), France World Cup in 1998 (2.67), U.S.A World Cup in 1994 (2.71), Italy World Cup in 1990 (2.21), and Mexico World Cup in 1986 (2.54) (Shin, 2002). Brazil team demonstrated higher scoring ability and goal determinant ability.

Table 1. Scoring analysis values

	Brazil team	Opponent team	
Goal (trial)	18	4	
Goal opportunities (trial)	65	51	
Number of attacks per goal (trial)	3.61	12.75	
Successful attacks rate per goal (%)	27.69	7.84	
Average goal per game (trial)	2.57	0.57	
Goal opportunities per game (trial)	9.29	7.29	
Field goal (trial)	Kick	13	3
	Heading	0	1
Set play goal (trial)	Free kick	2	0
	Corner kick	1	0
	Penalty kick	2	0

2. Success and allowance factors in a score

The success and allowance factors in a score are in Table 2. The combination play showed 38.9 %. The goal by individual techniques and the set play represented evenly, 27.8 %. The percent of scoring at the combination play of Brazil team showed lower value than that of Korea · Japan World Cup in 2002 (50.9 %), France World Cup in 1998 (53.2 %), and U.S.A World Cup in 1994 (56.7) (Shin, 2002). Specially, the scoring percent by individual techniques in Brazil team was higher than that in Korea (Japan World Cup in 2002 (8.7 %), France World Cup in 1998 (10.5 %), U.S.A World Cup in 1994 (10.6 %) (Shin, 2002).

Table 2. Success and allowance factors in a score

Score success factors	Combination play		Individual techniques		Set play		own goal	
	trial	%	Trial	%	trial	%	trial	%
Brazil team	7	38.9	5	27.8	5	27.8	1	5.6
Opponent team	3	75.0	1	25.0	0	0.0	0	0.0
Score allowance factors	Cover play miss		Individual mark miss		Ball control, pass, kick miss		Circumstantial judgment miss	
	trial	%	trial	%	trial	%	trial	%
Brazil team	2	50.0	0	0.0	2	50.0	0	0.0
Opponent team	6	33.3	9	50.0	2	11.1	1	5.6

3. Characteristics of the attack in score opportunities

The characteristics of the attack in score opportunities are in figure 1. As indicated in figure 1, characteristics of the attack in Brazil team showed various routines whereas an opponent team produced higher percent of attack (43.1%) after defense line located. Specially, the counter attacks by the pass from the defender to the striker and the set plays that has high scoring percentage was much more performed than those of opponent. This indicated that Brazil team might play more efficiently without making any disadvantageous condition such as a counter attacks and fails in passing.

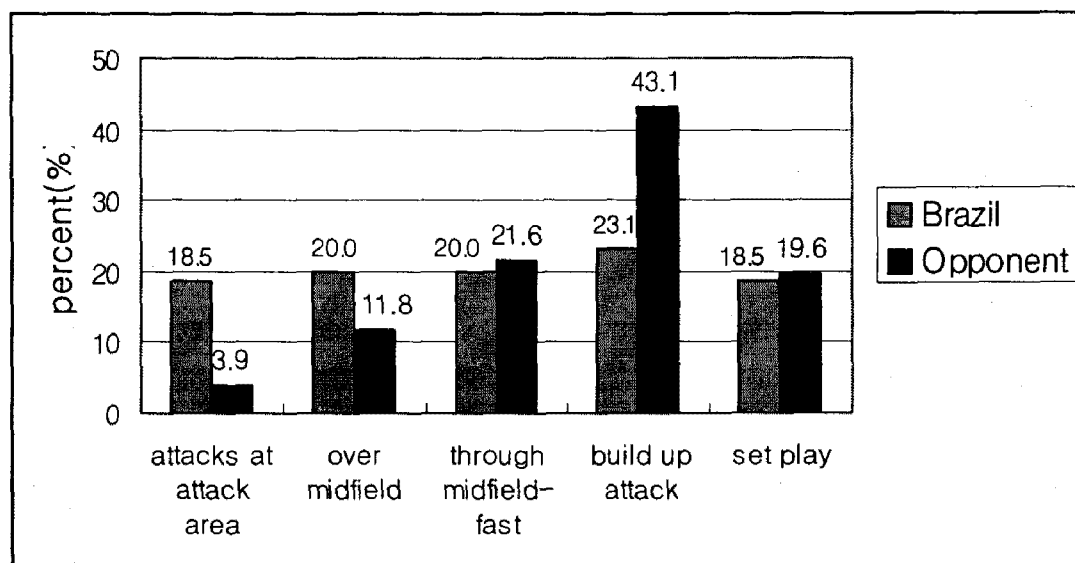


figure 1. The characteristics of the attack in score opportunities

Note. Over midfield : attacking by pass from a defender to striker, Through midfield-fast : attacking fastly through midfield, Build up attack : attacking when defenders are in position.

4. Ball possession numbers and index

The ball possession numbers and the index are in Table 4. Brazil team showed that the most players except a goalkeeper had similar ball possession numbers. This indicated that all players had played equally important role in each position. Ball possession numbers showed that Roque Junior as a left defender was 34, Roberto Carlos as a left midfielder was 37, and Ronaldinho as a right forwarder was 33. Index values demonstrated that Edmilson as a midfilder was 3.3, Kleberson as a left inside midfielder was 5.0, and Ronaldo as a striker was 1.4.

In overall, index values were increasing in the order of attack, midfield, and defense positions. It explains that the defenders played more efficiently than those in the attack positions. That is because less number of attackers has to play against more number of defenders (Reilly & Thomas, 1997).

Brazil team showed higher index values than Norway team during forty-four games between 1991 and 1994. Index values for Brazil team and Norway team were 3.0 and 2.7 in the defense position, 2.7 and 1.8 in the midfield position, 1.2 and 1.4 in the attack position, and 2.1 and 1.99 in overall, respectively (Reilly & Thomas, 1997).

Table 4. The ball possession numbers and the index

Position	ball possession numbers			Adding point during defense	Adding point during attack	Subtracting point during defense	Subtracting point during attack	index
	First half	Second half	total					
GK	4	4	8	8	0	0	0	
RDF	15	12	27	13	4	4	3	2.4
CDF	17	8	25	17	3	4	2	3.3
LDF	23	11	34	16	3	5	3	2.4
Defender	59	35	94	54	10	13	8	3.0
RMF	15	12	27	8	0	4	3	1.1
RIMF	16	15	31	7	8	4	2	2.5
LIMF	16	16	32	7	13	0	4	5.0
LMF	20	17	37	11	8	3	3	3.2
Midfielder	67	60	127	33	29	11	12	2.7
RFW	22	11	33	2	10	3	10	0.9
CFW	12	14	26	3	17	2	12	1.4
LFW	13	14	27	5	10	2	10	1.3
Defender	47	39	86	10	37	7	32	1.2
Total	173	134	307	97	76	31	52	2.1

Note. Index = (Adding point during defense + Adding point during attack) / (Subtracting point during defense + Subtracting point during attack)

5. Statistical analysis

Pearson Correlation is in Table 5. In the table 5, as regarding to the scoring success rate, the success rate by set play ($r=.547$) and ball involvement rate ($r=.625$) demonstrated direct relationship. The scoring opportunities per goal ($r=-.887$) and the scoring opportunities ($r=-.772$) demonstrated indirect relationship. In order to improve score success rate, it is necessary to increase the success rate by set play, ball possession rate and the scoring opportunities per goal.

Table 5. Pearson Correlation

		Set play success rate	Score opportunities per goal	Score opportunities	Ball possession rate	Shooting trials	Valid shooting trials
Score success rate	Pearson Correlation	.547	-.887*	-.772*	.625	-.377	-.320
	Sig.(2-tailed)	.203	.008	.042	.133	.405	.485
	N	7	7	7	7	7	7

Note. * Correlation is significant at the .05 level(2-tailed).

Score success rate = (score / score opportunities) × 100, Set play success rate = (set play score / score) × 100,

Score opportunities per game = (Score opportunities / score), Ball possession rate = (ball possession time at attack area / whole time) × 100, Valid shooting trial = trial of shooting toward goal post

IV. Conclusions and Suggestions

We investigated seven soccer games played by Brazil team, who won the championship in Korea · Japan World Cup in 2002 using statistical methods. We found following results.

Brazil team had more score opportunities than the opponent team throughout various attack routines such as attacking by pass from a defender to striker (20.0%), attacking fastly through midfield (20.0%), attacking when defenders are in position, set play (18.5%) and attacking at attack area (18.6%). The individual techniques (27.8%) and the set play (27.8%) were factors to increase goals. The opponent team showed higher percents of attack (43.1%) after defense line located. This indicated that Brazil team might play more efficiently without making any disadvantageous condition such as the counter attack and the pass miss. Brazil team showed that the most players except a goalkeeper had similar ball possession numbers. This indicated that all players had played equally important role in each position. The index values of center defender(3.3), left inner midfielder (5.0) and center forwarder (1.4) showed the highest values in each position. Therefore, the center defender, left inner midfielder and center forwarder made better performance in their position. Brazil team increased score success rate with increases of both the set play success rate and the ball possession rate in an attack area.

We suggest that the research should analyze more number of soccer games to get statistically enough data.

This study may provide play characteristics of individual athlete, weak and strong points, and performance enhancement during defense and attack play. Therefore the results of this study may help coaches and athletes by giving information, improving efficient tactic performance.

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