Differences in game statistics between winning and losing rugby teams in the Six Nations Tournament

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Abstract

The objective of the present study was to analyze the differences in rugby game statistics between winning and losing teams. The data from 58 games of round robin play from the Six Nations tournament from the 2003-2006 seasons were analyzed. The groups of variables studied were: number of points scored, way in which the points were scored; way teams obtained the ball and how the team used it; and technical and tactical aspects of the game. A univariate (t-test) and multivariate (discriminant) analysis of data was done. Winning teams had average values that were significantly higher in points scored, conversions, successful drops, mauls won, line breaks, possessions kicked, tackles completed, and turnovers won. Losing teams had significantly higher averages for the variables scrums lost and line-outs lost. The results showed that: a) in the phases of obtaining the ball and more specifically in scrummage and line-out, winning teams lose fewer balls than losing teams (winning teams have an efficacy of 90% in both actions); b) the winning team tends to play more with their feet when they obtain the ball, to utilize the maul as a way of attacking, and to break the defensive line more often than the losing team does; and c) On defence, winning teams recovered more balls and completed more tackles than losing teams, and the percentage of tackles completed by winning teams was 94%. The value presented could be used as a reference for practice and competition in peak performance teams.

Key words: Notational analysis, match analysis, team sports, performance indicators.

Introduction

The study of sport through the observation of players' and teams' behaviour is vitally important for the organization, design, teaching, and training of team sports (Hughes and Franks, 1997; Hughes and Bartlett, 2002). The majority of these research studies analyze the different performance indicators within each athletic discipline. Performance indicators are defined as the selection and combination of variables that define some aspect of performance and help achieve athletic success (Hughes and Bartlett, 2002; O'Shaughnessy, 2006). These indicators constitute a profile of ideal performance that should be present in the athletic activity to achieve this performance and can be used as a way to predict the future behaviour of sporting activity (Gomez, Lorenzo, Sampaio, Ibáñez, and Ortega, 2009; Ibáñez et al., 2008; O'Donoghue, 2005; Ortega, Giménez and Olmedilla, 2008; Sampaio et al., 2008).

In rugby, research about the game has traditionally been focused on describing the patterns of the game (Eaves and Hughes, 2003; Eaves et al., 2005; Williams et al., 2005), work ratios (Deutsch et al., 2007; Duthie et al., 2003, 2005), and performance indicators (James et al., 2005; Jones et al., 2004; Prim et al., 2006). Some of these studies relate these aspects to the result of the game (winning or losing). For example, Hunter and O'Donoghue (2001) compared the performance of winning and losing teams in the 1999 World Cup games. This study found significant differences in favour of winning teams in two of the eleven analyzed variables; a) frequency with which the winner invaded the rival's 22 metre zone and b) points that these teams achieved each time that they invaded the rival's 22 metre zone. Along these lines, Hughes and White (2001) found that the forwards on winning teams are more effective in the line-out, as they have more variations to get possession in this formation, and in the scrummage, where they are better at pushing. Stanhope and Hughes (1997) found that successful teams in the 1991 World Cup had better performance in the ruck, recovered a higher number of balls, and had a more effective foot game.

Jones et al. (2004) and James et al (2005) also described differences between winning and losing teams but unlike the aforementioned studies, they assessed the performance of only one team and the performance in one confrontation between two teams. The results from these studies demonstrate that teams obtain more balls in the line-out in the zone of the rival's field when they win than when they lose.

In general, winning teams demonstrate better performance than losing teams in effectiveness of scoring points each time they invade the opponent's field (Hunter, and O'Donoghue, 2001) and in the line-out (Hughes and White, 2001; Jones et al., 2004), in play continuity, in keeping the ball in dynamic phases of play, and they have a more efficient foot game (Stanhope and Hughes, 1997).

The analysis of game statistics, with regard to individual and collective skills, is one of the tools that can be utilized to describe and monitor behaviour in competition. In spite of the limitations that can arise from the different variables used in these studies (Hughes, et al., 2002), this type of data is useful to have greater knowledge of the game.

When analyzing the studies, some limitations and/or methodological problems in the study of these aspects are observed. For example, the analysis is done at one specific moment (one competition). Also, all games of the competition are not analyzed (only those in which one team plays), and in large part, a univariate analysis of

the observed variables is done. The objective of the present study was to analyze the differences in different game statistics of the game of rugby between winning and losing teams.

Methods

Sample
The data from 58 games of round robin play from the Six Nations tournament from the 2003 (12 games), 2004 (15 games), 2005 (15 games), and 2006 (15 games) seasons were analyzed. The participating teams were the national teams from England, Wales, Scotland, Italy, Ireland and France (the information for two games from the 2003 season were not analyzed as they were not accessible).

The data were collected from the official web page of the Six Nations tournament (www.rbs6nations.com). Data collection was carried out by the SAS Software Ltd. Company (http://www.sas.com/offices/europe/uk/rugby/alsim.html), and data registry was done at once. The data from each game were passed to a spreadsheet (Microsoft Excel) and were then exported to the SPSS 15.0 statistical program for analysis.

Procedures
The studied variables were divided into three groups (Table 1). The first group of variables, "*points scored*", describes the number of points scored and the way in which the points were scored; the second group of variables, "*phases of play*", describes the way teams obtained the ball and how the team used it; and the third group of variables, "*game development*", describes technical and tactical aspects.

Table 1. Variables studied in the Six Nations tournament during the 2003-2006 seasons.

Group of variables	Variables or game statistics or performance indicators
Variables related to points scored	Points scored; tries scored; conversions; penalty goal errors; successful penalty goals; drop errors; successful drops.
Variables related to phases of play	Scrums won; scrums lost; line-outs won; line-outs lost; balls won in open play; balls won in the opponent's 22mts zone; balls won in the attack phases; mauls won; ruck and drive; errors made; ruck and pass.
Variables related to game development	Line breaks; penalty goals conceded; possessions kicked; possessions of kicks to touch; kicks to touch; tackles made; tackles missed; tackle completion; passed completed; turnovers won.

Note: Variables are from the official statistics of the Six Nations rugby tournament (www.rbs6nations.com).

The data were obtained from the official statistics of the tournament. Information from each game was passed to a spreadsheet (Microsoft Excel) and were then exported to the SPSS 15.0 statistical program for analysis.

Statistical analysis
First, a descriptive analysis of the data was done. Second, a Mann-Whitney U (non-parametric) was carried out with the goal of analyzing the differences between winning and losing teams. Finally, a discriminant analysis (Ntoumanis, 2001) was done to find those statistical variables that best differentiate winning and losing teams. Structural Coefficients (SC) greater than or equal to $|.30|$ (Tabachnick and Fidell, 2001) were considered relevant for the interpretation of the linear vectors. All of the statistical analyses were done with a level of significance of $p \leq 0.05$.

Results

The average values, standard deviations, and medians of the values of the variables studied between winning and losing teams are demonstrated in Table 2.

For the first group of variables (points scored), winning teams had averages that were significantly higher for the following variables: points scored [$Z=-7.724$, $p < 0.001$], tries [$Z=-5.570$, $p<.001$], conversions [$Z=-5.477$, $p < 0.001$], and successful drops [$Z=-3.450$, $p < 0.01$]. Winning teams also had higher averages for the rest of variables, however no significant differences were found (Table 2).

For the second group of variables (phases of play), winning teams had averages that were significantly higher in the variable mauls won [$Z=-347$, $p < 0.001$]. Winners also had non-significantly higher averages in the variables scrums won [$Z=-0.228$, $p = 0.820$], line-outs won [$Z=-0.1042$, $p = 0.297$], and balls won in the attack phases [$Z = -0.871$, $p = 0.384$]

Losing teams had significantly higher averages for the variables scrums lost [$Z=-2.282$, $p < 0.05$] and line-outs lost [$Z=-3.470$, $p < 0.001$]. Additionally, losing teams had non-significantly higher averages in the variables balls won in open play [$Z=-1.204$, $p = 0.228$], balls won in the opponent's 22mts zone [$Z=-0.326$, $p = 0.744$], ruck and drive [$Z=-1.565$, $p = 0.118$], and ruck and pass [$Z=-.743$, $p = 0.457$].

For the third group of variables (game development), winning teams had significantly higher averages for the following variables: line break [$Z=-2.610$, $p < 0.01$], possessions kicked [$Z=-2.311$, $p < 0.05$], tackle completion [$Z=-2.248$, $p < 0.050$], and turnovers won [$Z=-2.255$, $p < 0.05$]. They also had higher averages, although insignificantly so, for the variables kicks to touch [$Z=-1.158$, $p = 0.247$], penalty goals conceded [$Z=-.150$, $p=.881$], tackles made [$Z=-1.375$, $p = 0.169$], and errors made [$Z=-.307$, $p = 0.759$]. Losing teams had insignificantly higher averages for the variable tackles missed [$Z= -1.071$, $p = 0.284$] and passes completed [$Z= -0.127$, $p = 0.899$].

The multivariate analysis showed that the discriminant function obtained was significant ($p \leq 0.05$), and it correctly classified 92.7% of winning and losing teams (Table 3). Specifically, when carrying out this analysis, the results demonstrated that when differentiating winners and losers, the only variables that discriminated the two groups were tries (SC = 0.474), and conversions (SC = 0.422).

Discussion

The purpose of this study was to analyze the differences in rugby game statistics between winning and losing teams. A global analysis of data was done to prevent or to

Table 2. Differences between winning and losing teams in game statistics from the Six Nations rugby tournament (seasons 2003-2006).

Variable	Winner			Loser			P^1
	M	SD	Median	M	SD	Median	Value
Variables related to points scored							
Points scored	30.41	10.39	30.5	13.50	6.97	13.0	.000
Tries scored	3.29	2.04	3.0	1.28	1.09	1.0	.000
Successful conversions	2.33	1.55	2.0	.84	.87	1.0	.000
Penalty goal errors	.85	.76	1.0	.87	1.22	1.0	.682
Successful penalty goals	2.76	1.60	3.0	1.76	1.27	1.5	.001
Drop errors	.60	.93	.0	.31	0.54	.0	.414
Successful drops	.28	.59	.0	.17	0.42	.0	.134
Variables related to phases of play							
Scrums won	8.09	3.07	8.0	7.97	3.10	8.0	.820
Scrums lost	.12	.33	.0	0.29	0.46	.0	.022
Line-outs won	17.46	3.76	17.5	16.75	4.32	17.0	.297
Line-outs lost	2.18	1.61	2.0	3.38	2.11	3.0	.001
Balls won in open play	62.43	19.13	57.5	66.10	19.55	62.5	.228
Balls won in the opponent's 22mts zone	17.12	11.05	15.5	17.41	13.24	14.5	.744
Balls won in the attack phases	35.55	5.53	35.0	34.62	6.44	34.5	.384
Mauls won	6.91	3.44	7.0	5.03	2.77	5.0	.001
Ruck and drive	15.57	11.12	12.0	19.02	12.72	14.0	.118
Errors made	18.69	5.25	19.0	19.40	6.54	18.5	.759
Ruck and pass	39.95	17.72	37.5	42.05	16.53	39.0	.457
Variables related to game development							
Line breaks	6.32	4.11	6.0	4.41	4.23	3.0	.009
Penalty goals conceded	10.07	3.13	10.0	10.00	2.78	10.0	.881
Possessions kicked	131.47	42.48	130.5	131.66	36.46	125.0	.899
Possessions of kicks to touch	29.41	8.33	29.0	26.10	7.42	25.0	.021
Kicks to touch	10.80	3.82	10.0	9.82	3.58	10.0	.247
Tackles made	84.84	24.85	84.0	78.64	25.85	74.5	.169
Tackles missed	9.74	4.65	9.0	11.28	6.24	10.0	.284
Tackle completion	89.55	4.34	89.5	87.57	3.88	87.5	.025
Passed completed	131.7	39.96	133.00	123.61	38.22	121.50	.204
Turnovers won	8.28	4.20	8.0	6.45	3.51	6.0	.024

[1] Mann-Whitney U.

compensate for an influence by play style, home/away, etc. Although this aspect may be considered a limitation by different authors (Jones et al., 2004; 2008), this type of study can give general values that help to understand and analyse rugby and to help to design training sessions. The data obtained in this study is different from the data obtained in case-studies as these authors proposed.

The results from the present study indicate that winning teams scored more than twice the amount of points that losing teams score. Winning teams scored more points from all possible ways to score. They scored more points for tries, for conversions, for penalty goals, and for drops. The results also indicate that winning teams carried out more penalty goal attempts and drops than losing teams. Specifically, from these results, it can be inferred that winning teams are stronger in offence than losing teams.

With regard to number of tries that the winners scored, the present study coincides with the reports published by the IRB (International Rugby Board). Specifically, 70% of winning teams scored more tries than losing teams (IRB, 2005; 2006; 2007).

Concerning the phases of successful ball acquisition (scrum and line-out), there were no differences between winning and losing teams. These results differ from those found by Hughes and White (2001) and Jones et al. (2004), which found positive results for line-outs in favor of the winners. However, upon analyzing the unsuccessful scrums and line-outs, the results from the present study demonstrate that winning teams lost fewer balls in this phase of play than losing teams. These results seem to indicate that losing balls in these phases of play negatively influenced the final result of the game. They also found higher values of turnovers won by winners. However, future studies are necessary to determine what kind of line-out or scrummage is most effective for getting or recuperating the ball.

Winning teams also won significantly more mauls. These values seem to recommend the use, or greater use, of this formation as a way of utilizing the ball once it is obtained. Nonetheless, more research to determine which would be the most efficient way of advancing the ball is suggested.

The results do not demonstrate differences in the ways the ball can be played after rucks, whether it be passing or driving. This seems to indicate that in high-level rugby ball-in-hand in penetration and spread ball-in-hand are equally successful phases of play. Along these lines, Stanhope and Hughes (1997) indicated that winning teams in the World Cup 1991 had better performance in rucks than losing teams.

Regarding the different forms of play that can be utilized in rugby, the results of this study demonstrate that winning teams had a higher number of kicked possessions and kicks to touch. This indicates that the foot game was used more by winning teams. However, from these re-

sults, it cannot be determined whether one form of play is more successful than another. More research is necessary to determine which form of play is more beneficial or provides more technical and tactical game advantages.

Table 3. **Standardized coefficients from the discriminant analysis of the game statistics between winning and losing teams in the Six Nations rugby tournament (seasons 2003-2006).**

Game statistics variable	Winner-Loser
Tries	.47 *
Successful conversions	.42 *
Mauls won	.22
Scrums lost	-.21
Line-outs lost	-.21
Successful penalty goals	.19
Turnovers won	.19
Tackle completion	.18
Balls won in the attack phases	.18
Line break	.16
Tackles missed	-.15
Line-outs won	.14
Possessions kicked	.13
Ruck and drive	-.12
Kicks to touch	.11
Drop errors	.11
Penalty goals conceded	-.10
Balls won in open play	-.08
Penalty goal errors	.07
Tackles made	.06
Ruck and pass	-.03
Passes completed	.03
Successful drops	-.02
Balls won in the opponent's 22mts zone	-.01
Errors made	.01
Scrums won	.00
Eigenvalue	1.89
Wilks' Lambda	.34
Canonical Correlation	.81
Chi-square	71.85
Significance	.00
Reclassification	92.7%

* SC discriminant value ≥|.30|

Of the few defensive variables collected in the official statistics, it was seen that winning teams have higher tackle completion and more turnovers won. These results seem to indicate that winning teams demonstrated higher performance in defence.

When analyzing the results overall, the univariate analysis (Table 2) showed that there are ten variables with statistically significant differences (tries, conversions, penalty goals, scrums lost, line-outs lost, mauls won, line breaks, possessions kicked, tackle completion, and turnovers won). On the other hand, when applying a multivariate analysis (Table 3), the number of statistically significant variables was reduced to two (tries, and conversions).

These results indicate that the type of statistical analysis will determine some results. It should be the goals of the study which determine the type of analysis that is most adequate. In the articles reviewed for the present study about rugby, all studies used univariate statistics in their analysis. In the present study, the multivariate analysis indicated some obvious results: the team that obtained more tries, and conversions won the game. These results can be directly extracted from the game regulations. The univariate analysis demonstrates where the differences in the form of play are, and although with lesser weight mathematically-speaking, they can better help to guide the process of training. The combination of both analyses allows for a more complete analysis of the variables studied. Nonetheless, it must be kept in mind that the differences with regard to mathematical probability are only one part of the analysis of the results. Therefore, the values found in the analysis of play, whether or not they are significant, can serve as a reference for coaches to guide their training sessions (for example, efficacy in the practice of drops that they should demand from the players during training sessions).

Conclusion

This study presents references values of game statistics and demonstrates in which aspects of the game there are differences between winning and losing teams. These values can be used to design training sessions and to evaluate matches. In order to connect theory with practice, after each conclusion a practical application is presented.

Winning teams obtained success percentages of 80% in penalty goals, 32% in drops, and 70% in conversions. These percentages can serve as references to establish training objectives for practicing kicks and for monitoring efficacy in situations of training and competition.

In the phases of obtaining the ball and more specifically in scrummage and line-out, winning teams lose fewer balls than losing teams (winning teams have an efficacy of 90% in both actions). These values allow for the establishment of game objectives for these actions. Since there is an average of 20 line-outs per game, then from this, it can be extrapolated that the team should not lose more than two line-outs per game. This efficacy percentage can also be utilized in training situations of this formation (the team should win nine of every 10 line-outs).

The winning team tends to play more with their feet when they obtain the ball, to utilize the maul as a way of attacking, and to break the defensive line more often than the losing team does. These results indicate that training situations that develop these aspects should be created and that these aspects can or should be kept in mind when planning the tactics of a game.

On defence, winning teams recovered more balls and completed more tackles than losing teams, and the percentage of tackles completed by winning teams was 94%. This value should be used as a reference to practice tackle situations in peak performance teams.

This paper has presented values that can be used as normative data to design and evaluate practices and competitions for rugby peak performance teams in a collective way. Coaches can use this information to establish goals for players and teams both in practices and matches. These goals can be oriented in a positive way (things or number of things to try to achieve) or in a negative way (things or number of things to try to avoid).

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Key points

- This paper increases the knowledge about rugby match analysis.
- Give normative values to establish practice and match goals.
- Give applications ideas to connect research with coaches practice.

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