

Predicting try scoring in super 14 rugby union – the development of a superior attacking team scoring system

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Abstract

The aim of this study was to determine if consecutive periods of attacking superiority, as determined by a developed Team Attacking Superiority (TAS) scoring system, could predict try scoring in Super 14 rugby. Game data from 9 games where the Crusaders, Force and Lions played each other in the 2006, 2007 and 2008 competition seasons were analysed. A Player Impact Ranking matrix, developed in an earlier study (Lim et al., 2009), was modified to create a Team Impact Ranking (TIR) matrix. The TIR was then used to calculate the TAS scores to assess consecutive periods of attacking dominance by a team. Results showed that 67% of tries scored resulted from teams maintaining 3 consecutive TAS periods or less. Although the majority of tries scored were from ≤ 3 consecutive TAS periods, odd ratios revealed that teams were 11.76 times more likely to convert TAS periods into tries scored if they were able to attain 4 or more TAS periods.

Keywords: performance analysis, possession, movement time.

1. Introduction

Rugby union, similar to other football codes, is a complex sport for notational analysis. Set-piece moves (scrums and line-outs) and post-tackle match activities (rucks and mauls) present a set of problems for match analyses unique to rugby union (Hughes & Franks, 2004). As such, the research scope of performance analysis in rugby union has generally been limited to certain aspects of the game, such as team specific playing patterns or physiological demands of various playing positions (Deutsch, Kearney & Rehrer, 2002; Hughes & Williams, 1988).

Recently, several studies have identified the importance of performance indicators in rugby union (Hughes & Bartlett, 2002) and subsequently, their development and implementation (James, Mellalieu & Jones, 2005; Jones, Mellalieu & James, 2004; Jones, James & Mellalieu, 2008). Performance indicators are referred to as “a selection, or combination of action variables that aim to define some or all aspects of a performance” (Hughes & Bartlett, 2002, p. 739). This definition is based on the fact that performance indicators can be independent of any other variables used when expressed

as non-dimensional ratios (Hughes & Bartlett, 2002). Other studies have looked at profiling rugby union by developing methodologies to assess performance scores and individual player performances (Bracewell, 2003; Lim et al., 2009). This development of performance indicators usually leads to the creation of performance profiles, providing a descriptive model of a team or individual's pattern of performance, thus possibly offering some prediction of future performance (Hughes, Evans & Wells, 2001).

Relatively low frequencies of try scoring are one of rugby union's common characteristics, especially when the game is played at a high level of competition, such as Super 14, a competition played by teams from Australia, New Zealand and South Africa. Several studies have highlighted the importance of try scoring and winning games (Jones, Mellalieu & James, 2004; Laird & Lorimer, 2004). Findings from an examination of the 2005 Super 12 Rugby Competition suggested try scoring (as distinct from other ways of scoring points) to be a key factor to the success of the Crusaders, who were the eventual winners of this competition (Prim, van Rooyen & Lambert, 2006). Thus, an objective evaluation of the characteristics of tries scored and the determinant factors that may lead to successful try scoring attempts is imperative in order for teams to develop winning playing strategies.

Of the myriad of possible determinant factors that relate to tries being scored, maintaining possession has been a subject of consistent scrutiny (Boddington & Lambert, 2004; Laird & Lorimer, 2004; van Rooyen, Lambert & Noakes, 2006; van Rooyen, Lombard & Noakes, 2008; van Rooyen & Noakes, 2006), and has been suggested to be a key factor to successful performances (van Rooyen & Noakes, 2006). It was also found that movements that led to points being scored took longer than movements that resulted in turnovers (van Rooyen, Lambert & Noakes, 2006). This finding suggests that the more time a team is in possession of the ball per movement, the higher the probability of points being scored from that movement. The same study found that the top 3 teams of the 2003 Rugby World Cup (RWC) tournament had greater mean (percentage) possessions than teams that finished below the top 4 nations. In another study that investigated data from a number of teams in the 2003 RWC tournament, over 50% of all movements lasted less than 20 s (van Rooyen & Noakes, 2006). Points were scored from 30% of the movements recorded for each team, with points being scored more frequently (44%) when these movements lasted between 60-80 s. All teams in the study converted the lowest percentage of possessions into points for movements lasting 0-20s. The authors suggested that the ability to maintain ball possession via movements that lasted more than 80 s was highly influential to point scoring and the final result in international Rugby Union. Similar findings were made in the 2005 RWC Sevens Tournament, where point scoring movements lasted for longer compared to "turn-over" movements, with more successful teams being better able to hold possession for more than 30 s. They were also more adept at converting at least 30% of those possessions to point scoring movements (van Rooyen, Lombard & Noakes, 2008). Whilst all the above studies examined point scoring movements (i.e. not exclusive to try scoring), studies have found that the mean time in possession of the ball before a try was scored was 21.9 ± 14.5 s (Boddington & Lambert, 2004; van Rooyen, Lambert & Noakes, 2006), indicating a higher likelihood of try scoring from longer possession times. Conversely, a study that reviewed 152 tries from games played in top

flight rugby union, found that 48% of successful tries were scored from no more than 3 passes, with a significant negative correlation ($-0.621, p < 0.05$) between the number of passes and the number of successful tries (Laird & Lorimer, 2004). These results suggested a decreasing likelihood of try scoring as more passes were made.

Existing literature on performance analysis in rugby union suggests a paucity of information on try scoring. Although a number of studies have examined the relationship between winning and losing performances in rugby union (e.g. Jones, Mellalieu & James, 2004; Ortega, Villarejo & Palao, 2009; van Rooyen, Lambert & Noakes, 2006), these studies do not provide a more in-depth analysis into the nature of try scoring. As a try scored provides the highest possible means of scoring points in a game of rugby union, it is important to investigate its many different and complex contributing factors. Past research has examined various key performance indicators (KPI), such as number of passes and possession time in relation to success or point scoring. This study seeks to further examine the influences of these KPI and other game actions by using a Team Attacking Superiority (TAS) scoring system, developed from the Player Impact Ranking (PIR) matrix that was designed in a previous study (Lim et al., 2009). The TAS aims to record frequencies of various game actions and then to quantify the quality of these actions. The analyses of this study are therefore based on the positive or negative impacts of these game actions, ultimately examining whether a positive team impact occurring for a longer duration (reflecting a sustained attacking period of play), is beneficial to try scoring.

1.1. Aim

The aim of this preliminary study was to explore the potential of an objective performance analysis tool to determine whether consecutive periods of attacking superiority, as determined by the TAS scoring system, could predict try scoring in rugby.

2. Methods

2.1. Study design and data sample

Games from the 2006, 2007 and 2008 Super 14 rugby union competition seasons were chosen for retrospective analysis. These data were used due to availability from an earlier study (Lim et al., 2009). Data from 3 teams (Crusaders, Force and Lions) were sampled. These teams were chosen as they were reflective of teams that finished near the top, middle and bottom of the competition ladder in each season, apart from the 2006 season when one team finished top and the other two finished either last or second last. As this was an exploratory study, we selected only 3 games from each season, where these teams played each other, in order to form the data sample for this study.

Another delimitation placed on this study was to only examine tries scored. Point scoring in rugby union is a complex process that comprises several different methods (i.e. tries, penalties, drop goals and conversions). We chose to only examine tries for several reasons. Firstly, a try scored represents the highest number of points scored from an action. Secondly, previous studies have highlighted the importance of try scoring and success (Jones, Mellalieu & James, 2004; Laird & Lorimer, 2004; Prim, van Rooyen &

Lambert, 2006). Thirdly, due to the different methods of point scoring and the further complexity of this task, it was decided not to classify all point scoring methods as one variable but rather to pick the one that yielded the highest points.

A team of notational analysts from Verusco coded game data, with the relevant data to this study downloaded using TryMaker Pro ^(tm) (Verusco Technologies Limited, Palmerston North, New Zealand). Using the methods and weighting techniques developed for the PIR matrix (Lim et al., 2009), a modified version called the Team Impact Ranking (TIR) matrix was developed (see below for details). Subsequently, by comparing two opposing team's TIR in a game, the TAS scoring system was developed.

2.2. Identification of game actions for Team Impact Ranking (TIR) matrix

Based on the development and subsequent use of the PIR matrix, a modified list of game actions and their respective weightings was decided upon in conjunction with the coaching staff of a Super 14 rugby union team. The main deciding factor in this process was how much influence a certain game action had on the cumulative build-up of attacking pressure applied by an attacking team. Conversely, the same considerations were applied to how capable the defending team was in preventing a cumulative build-up of attacking pressure. Successful and desirable actions were awarded positive scores, whilst game errors were awarded negative scores. For scrums and lineouts, the respective weighting of the event was multiplied by 8, signifying the number of players in the forward pack. The list of actions, operational definitions and their respective weightings that made up the TIR can be found in Appendix A.

2.3. Development of Team Attacking Superiority (TAS) scoring system

A team's game action weightings were matched to their time of occurrence during the game, as recorded by Verusco. These game action weightings were then consolidated into 30 s time periods, adding (for positive actions) or subtracting (for negative actions) all of the team's game action weightings that fell within the same 30 s time period, to obtain a 30 s net weighting score. The same procedure was performed for the opposing team. A differential of the two team's 30 s net weighting scores was then obtained. The average differential score was calculated using the absolute values of the differential scores, which was found to average 15.5 across the 9 games.

Based on the average differential score value, a team was considered to have dominated a 30 s period of play if the differential score for that period was equal to or higher than 16. A 30 s period of dominant play forms the definition of a TAS period, with the respective differential score between two competing teams used as a TAS score. If, from one 30 s time period to the next, a team was observed to have dominated the period of play, then a cumulative effect was included and the differential score from one 30 s time period was added to the next. For example, in the event of two or more consecutive 30 s time periods where the average absolute differential scores of all these periods is equal to or greater than 16, there is a cumulative effect on differential scores, leading to more consecutively running TAS periods.

2.4. Reliability

Verusco Technologies Limited provides notational analyses services to 13 of the (then) Super 14 teams, the All Blacks, the Wallabies, the Canadian Rugby Union and a host of

other teams in various competitions internationally. The level of coding is maintained and performance of coders is regularly reviewed via both specific and randomly selected data. Coders undergo intense training and clearly defined actions and events have been well established. Verusco Technologies Limited currently report that instances of critical error during coding vary from 0.06% to 0.48% of tasks coded, depending on a coder’s experience, with the average reported instances of errors being 0.24%.

2.5. Statistical analysis

Due to the complexities of the various forms of point scoring in rugby union, the main focus of this short paper was to examine the relationship between sustained attacking play and try scoring. Thus, the TAS scores that immediately preceded all other point scoring events such as penalty and drop goal attempts were omitted. Logistic regression was used to assess if the number of TAS periods was a strong predictor of try scoring. Statistical significance was set at $p < 0.05$.

3. Results

Tables 1 and 2 present the relationship between the number of TAS periods and try scoring. From Table 1, it was observed that the b coefficients for 2, 3 and 4 or more TAS periods were significantly different from zero, thus having a significant contribution to the try scored. The increasing odds ratios that occurred as the number of TAS periods increased indicates that a try was more likely to be scored when a higher number of TAS periods were achieved. For example, a try was 7.8 times more likely to be scored when three TAS periods were attained as compared to one TAS period. Table 2 shows the highest number of tries being scored from 1, 2 and 3 TAS periods, nearly doubling or tripling some of the results posted for four or more TAS periods. However, TAS periods 1, 2 and 3 also recorded the highest frequencies (the combination of tries scored and tries not scored), which then sharply reduced to less than 20 from four TAS periods onwards. Table 2 also shows a breakdown comparing the odds ratios of try scoring between the different TAS periods, demonstrating that as the number of TAS periods increases, the odds ratio of scoring a try becomes higher.

Table 1. Logistic regression results for Team Attacking Superiority (TAS) periods as a predictor of a try scored, represented by b coefficients and odds ratios

Number of TAS Periods	B (SE)	Odds Ratio	95% C.I. for Odds Ratio	
			Lower	Upper
2	1.11 ^a (0.49)	3.02	1.15	7.90
3	2.05 ^a (0.50)	7.78	2.94	20.60
4 or more	2.47 ^a (0.48)	11.76	4.57	30.24

Note: $R^2 = .12$ (Hosmer&Lemeshow), .08 (Cox & Snell), .16 (Nagelkerke). Model $\chi^2(3) = 34.31, p < .05$
^a $p < .05$: significantly greater than 0 TAS periods

Table 2. Frequencies of try outcomes and odds ratios for tries scored between Team Attacking Superiority (TAS) periods.

Number of TAS Periods	Tries Scored (% of total tries scored)	Tries Not Scored	Total TAS cases	Odds of Try	Odds Ratios for Tries Scored between TAS Periods					
					1	2	3	4	5	6
1	8 (19%)	215	223	0.04		0.33	0.13	0.16	0.07	0.04
2	10 (23%)	89	99	0.11	3.02		0.39	0.48	0.22	0.11
3	11 (25%)	38	49	0.29	7.78	2.58		1.23	0.58	0.29
4	4 (9%)	17	21	0.24	6.32	2.09	0.81		0.47	0.24
5	5 (12%)	10	15	0.5	13.44	4.45	1.73	2.13		0.50
6	2 (5%)	2	4	1	26.88	8.90	3.45	4.25	2.00	
7	3 (7%)	3	6	1	26.88	8.90	3.45	4.25	2.00	1.00

4. Discussion

This short paper aimed to determine whether consecutive periods of attacking superiority, as determined by the TAS scoring system, could predict try scoring in rugby. Whilst previous studies have focused purely on movement times, number of passes or possession times, the TAS scoring system considers all game actions, thus allowing for an objective analysis of game events that may lead to try scoring.

Our findings showed that the highest frequency (67%) of try scoring occurred from three TAS periods or less. This result concurs with the findings of Laird and Lorimer (2004) who found that 48% of successful tries were scored from no more than three passes. Van Rooyen and Noakes (2006) also reported that team movements whilst maintaining ball possession lasting 60 s or higher produced the greatest percentage of points scored in the 2003 RWC Tournament. Although the highest frequency of tries scored occurred from a lower number of TAS periods, the implications of this finding need to be carefully considered when examined together with the frequency of lower TAS periods. Of 417 TAS periods notated over the nine games studied, 371 (89%) resulted in three consecutive TAS periods or less, whilst 223 (53%) cases resulted in only one TAS period. This finding supports previous research in which over 50% of all team movements (maintaining possession) were found to have lasted less than 20 s (van Rooyen & Noakes, 2006). Hence, although the most tries were scored from three or less TAS periods, the odds (0.04-0.29) of scoring a try from these numbers of TAS periods were not as high as might have been expected. This occurrence can be explained by the fact that with an increasing number of passes or ball handling, the team in possession is increasing the chances of either making a mistake or handling error, or increasing the chance that the opposition will create a turnover situation due to good defensive skills. Hence, although it was relatively easier to establish attacking dominance over a shorter period of time, maintaining this dominance over an extended period of time proved to be much more challenging. It is acknowledged that a side in possession often does not wish to lose the ball, but because of poor play on their part, or superior play by the opposition, they are not always able to do as they may wish.

Past research has often linked point scoring to possession time. Recently, point scoring movements were reported to take longer than movements that resulted in turnovers (van Rooyen, Lambert & Noakes, 2006), suggesting an influence of possession time on point scoring. Our findings show that the lowest odds of converting attacking dominance into tries were in one TAS period (0.04). This finding agrees with that of van Rooyen and Noakes (2006), who demonstrated that the lowest percentage of all team's conversions of possession into points were from movements lasting less than 20 s. Our findings show that as the number of TAS periods increased, so did the odds ratios of try scoring e.g. a team was 3.02 times more likely to score a try after two TAS periods, as compared to one TAS period. Consequently, a team was 11.76 times more likely to score a try after four or more TAS periods. These findings are in agreement with those of Hughes and Franks (2005), who reported that, while between 1 and 4 passing sequences were most common in soccer, there was a greater likelihood of scoring from longer passing sequences. Similarly, although we found that shorter length possessions in rugby union seem to contribute to the majority of tries scored, there is actually more probability of scoring tries through longer chains of possessions. This underscores an important point for analysts and coaches to consider: while most scores may come from fewer passing sequences, this may principally reflect the nature of these games, where there is a high volume of change of possession. It is also important to consider the likelihood or probability of scoring, which may be greater with an increased time in possession.

5. Conclusion

Our findings show that whilst it is easier for a team to sustain attacking dominance over a lower number of TAS periods, the likelihood of converting these periods of possession and dominance into tries markedly increases based on the more TAS periods a team is able to sustain. However, due to time constraints and the challenging nature of obtaining the necessary data for this study, only nine games from the 2006, 2007 and 2008 seasons where the Crusaders, Force and Lion rugby teams played each other were examined. Future studies should examine a larger data set to see if the findings from this study can be confirmed.

Nonetheless, this short paper represents a first attempt at exploring the potential of an objective performance analysis tool to analyse a team's attacking superiority during a game and whether or not this is associated with a greater chance of scoring tries.

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Appendix

A. List of individual game actions, operational definitions and weightings.

Individual GA	Operational Definition	Weighting
Try Scored	5 points awarded to the scoring team when the ball is placed down in the try area	+75
Try Conversion	Additional 2 points awarded when the ball is kicked between the posts after a try is scored	+30
Penalty Conversion	3 points awarded when the ball is kicked between the posts from a penalty	+45
Drop Goal	3 points awarded when the ball is drop kicked between the posts from open play	+45
Tactical Kick Regained	Team regains possession after a tactical kick	+6
Breach	Carrying the ball through the opposition defensive line resulting in at least one opposition player having to turn around to make the tackle	+6
Field Kick > 40m	Successfully kicking the ball over a distance of 40m or more	+3
Offload	Passing the ball on to a supporting player when being tackled, thus maintaining the forward flow of play	+6
Ball Placement (Fast)	Quick placement (<3s) of ball when tackled, making the ball available for quick recycling	+3
Attack Support	First supporting player to arrive in a tackle situation to lend attacking support	+3
Set Piece (Score)	5 points awarded to the scoring team when the ball is placed down in the try area directly off a set piece play (i.e. scrum or line out)	+3

Ball Carry		Carrying the ball into the opposition defensive line causing more than one opposition players to commit to a tackle situation	+2
Pass/catch (Under Pressure)	(Under Pressure)	Passing/catching the ball under opposition pressure. Includes picking the ball from base of ruck.	+2
Field Kick (Under Pressure)		Successfully kicking the ball under opposition pressure	+2
Ball Placement (Medium)		Medium speed (3-5s) placement of ball when tackled, allowing for average recycling of the ball	+2
First Arrival (Ruck)		First player to arrive in a tackle situation to clear out the ruck	+2
Second Arrival		Second player to arrive and secure the ruck	+2
Set Piece (Good Platform)		Set piece won, unless driven backwards	+2
Ball Carry (No Fight)		Carrying the ball into the opposition defensive line requiring only one opposition player to commit to the tackle situation	+1
Pass/catch (No Pressure)	(No Pressure)	Passing/catching the ball under no opposition pressure	+1
Field Kick (No Pressure)		Successfully kicking the ball under no opposition pressure	+1
Ball Placement (Slow)		Slow placement (>5s) of ball when tackled, causing slow recycling of the ball	+1
Third and Fourth Arrival		Third and fourth players to arrive to the ruck	+1
Set Piece (Untidy)		Set piece won, but driven backwards or wheeled to disadvantage	+1
Try Saving Tackle		A tackle that directly results in preventing a certain try from being scored by the opposition	+25
Kick Receipt (Contested)		Receiving a kick under a contested situation	+3

Turnover Tackle	A tackle that results in turnover of possession	+10
Set Piece Turnover	Turnover of possession from a set piece situation	+2
Dominant Tackle	Tackle that drives opposition player backwards	+2
Jackal	Attempt to steal the ball from a tackle situation in a turnover attempt	+2
Set Piece (Disrupt)	Driving the opposition set piece backwards or wheeling them into a disadvantageous situation	+1
Kick Receipt (No Pressure)	Receiving a kick under no pressure	+1
Passive Tackle	Tackling of opposition player	+1
Tackle Assist	Assisting in a tackle situation	+1
Set Piece (Opposition Platform)	Engaging in set piece but still allowing the opposition to have a good platform to attack from	0
Error in play	Errors made in play (e.g. handling errors etc)	-2
Game Law Infringement	Infringement of the laws of the game resulting in free kick or penalty	-10
Turnover Event	Error in play that directly results in turnover of possession to the opposition	-10
Set Piece Lost/Infringement	Lost own set piece or infringement of set piece rules	-2
Missed tackle	Missing a tackle	-6
Set Piece Opposition Score	Opposition score from a set piece	-3
Yellow Card	Results in carded playing being sent off to the sin bin for 10 minutes, leaving their team one player down for that duration	-45

Red Card	Results in carded player being sent off, having no further participation in the game, leaving their team one player down for the rest of the game	-75
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