South African Journal for Research in Sport, Physical Education and Recreation, 2017, 39(2): 89 – 100.
Suid-Afrikaanse Tydskrif vir Navorsing in Sport, Liggaamlike Opvoedkunde en Ontspanning, 2017 39(2): 89 – 100.
ISBN: 0379-9069

MODIFYING SCORING SYSTEM AT SOUTH AFRICAN UNIVERSITY RUGBY LEVEL CHANGES GAME DYNAMICS

Wilbur KRAAK[1], Karen WELMAN[1], David CARRERAS[2], Luis VAZ[3]
[1] *Department Sport Science, Stellenbosch University, Stellenbosch, Rep. of South Africa*
[2] *National Institute of Physical Education of Catalonia, Lleida University, Lleida, Spain*
[3] *Research Centre for Sport Sciences, Health and Human Development (CIDESD), University Tras-os-Montes e Alto Douro, Vila Real, Portugal*

ABSTRACT

Success in rugby is measured by winning the game and in order to do so, teams need to score more points than the opposing team. The primary aim of this study was to investigate and compare the scoring profile of the 2011 and 2012 tournaments and to determine if modifying the scoring system at South African University rugby level changes the game dynamics. Sixty-two Varsity Cup matches were recorded and analysed during the 2011 and 2012 season using Dartfish software® package. In 2011 the home teams scored 773 points compared to the 816 points obtained by away teams, whereas in 2012 the opposite were found with home teams scoring 999 points, compared to 775 points for the away teams. The most points were accumulated during the 2nd half of the match during both seasons. Having a scoring profile will provide coaches with information on which mode of scoring their team relies on to win matches. The law changes led to more tries being scored, however, the question remains whether rugby at university level improved as a spectacle.

***Keywords*:** Mode of scoring; University tournaments; Home and away teams; Points scoring system.

INTRODUCTION

Rugby research has focussed on a range of Performance Indicators (PIs) pertaining to game structures, tactical aspects, physical aspects and team performance (Vahed *et al*., 2014). Research has included the analysis of PIs in rugby on different levels of competition (Bell *et al*., 1993; Gabbett, 2000; Vaz *et al*., 2010; Coughlan *et al*., 2011), the effect of law changes and effect of foul play (Madden, 2000; Quarrie & Hopkins, 2007; Fuller *et al*., 2009; Arias *et al*., 2011). The demands and nature of sport change over time due to either technological advances and/or law changes. Law changes (also referred to as rule changes) and amendments are fundamental to the development of sports and are introduced for a variety of reasons (Kraak & Welman, 2014). Some of the reasons why law changes and amendments are implemented in rugby are in response to player performance, to ensure safety, enhance participation and enjoyment, promote game continuity, technological advancement and commercial pressures, as well as to retain game integrity and development (Eaves *et al*., 2008). Professionalism in rugby has resulted in the need for improved scientific and analytical support aimed at maximising performance (Vaz *et al*., 2011).

Success in rugby is measured by the winning team scoring more points than the opposing team (Van Rooyen *et al*., 2006). Five points are awarded for scoring a try or being awarded a penalty try, two points for successfully converting a try and three points for a successful penalty kick or a drop goal. During a match, teams can accumulate points by one or more of these modes of scoring. All of these modes can be decisive in determining the outcome of a match (Ortega *et al*., 2009; Stefani, 2009; Lim *et al*., 2011; Vaz *et al*., 2011). A scoring profile will provide coaches with information on the mode of scoring of their team. Timing of these modes of scoring can also provide important strategic information.

The Varsity Cup (VC) organising committee has changed the value of points awarded for specific mode of scoring (Table 1) for the 2012 tournament; special permission was granted by the International Rugby Board, currently known as World Rugby (WR), for the trial. The intention of the trial was to cement a try scoring culture and improve rugby as a spectacle at University level rugby in South Africa. Hence, it is suggested that by changing the point scoring system, the tactical importance would shift from penalty kicks and drop goals to tries. This change in approach may also result in intentional infringements since the defending teams may be encouraged to infringe more since conceding a penalty kick would have a preference above conceding a try. According to Arias *et al*. (2011), changes to the scoring system are referred to as external logic and the criteria are concerning elements that are further from or nonessential to the game. These elements include the nature of the competition, the scoring system and the characteristics of the material, team differentiators, game moments or seasons. Game actions may emerge without these elements, although this could influence game dynamics.

In competitive sports, teams playing at home are usually considered to have an advantage over teams playing away from home (Kerr & Van Schaik, 1995; Pollard, 2006). The number of home game wins usually exceeds the number of away game wins over a balanced home and away competition (Courneya & Carron, 1992). The VC is classified as an unbalanced competition structure as the eight teams will play seven round robin matches per season. The home advantage will alternate from year to year meaning that every second year a team will play four games at home and three away and vice versa the next season. Factors that could be relevant to team performance include crowd effects, travel fatigue, psychological states of the players, referee interpretations and team quality (Nevill & Holder, 1999). One such factor, however, which cannot be controlled, is the lack of balance in the competition structure, for example teams may play the weaker teams at home one year and away the next. However, home field advantage can have different effects on teams and players in most team sports, the home or hosting team is considered to have a significant advantage over the visiting teams (Nevill & Holder, 1999; Carron *et al*., 2005; Morton, 2006; Pollard, 2006; Du Preez & Lambert, 2007; Thomas *et al*., 2008).

PURPOSE OF STUDY

The profile of sport rarely remains the same, as it is frequently pushed to the limit by coaches, referees and players (Eaves *et al*., 2008). Williams *et al*. (2005) stated that the effect of law changes in a sport cannot be objectively determined, unless there is some form of measure associated with it. Therefore, the primary aim of this study was to investigate and compare the scoring profile of the 2011 and 2012 tournaments and to determine if modifying the scoring

system at South African University rugby level changed the game dynamics. The specific objectives were: (a) to investigate the mode of scoring for 2011 and 2012; (b) to determine which mode of scoring discriminates between the 1st and 2nd half; (c) to determine which mode of scoring discriminates between the home and away teams; and (d) to compare the percentage (%) contribution of each mode of scoring for the round robin and play-off stages for the 2011 and 2012 seasons.

METHODOLOGY

Study design

The researchers made use of mixed-method approach and descriptive study design. Mixed-method research is when researchers combine elements of qualitative and quantitative research approaches (De Vos *et al*., 2005). Therefore, this study design included both qualitative (semi-structured interviews with four university rugby coaches and quantitative (Level 6 accredited performance analyst by the International Society of Performance Analysis of Sport, who is also an accredited WR coach educator and a Level 3 coach) methods. These elements were used both in isolation and in combination, depending on the objective studied at the stage of the research.

At a conceptual level, the predominantly qualitative nature of the semi-structured interviews were ideal to obtain a good level of understanding of the effect of changes in the mode of scoring on the scoring profile of South African University rugby between 2011 and 2012. The performance analysis provides an ideal vehicle to test possible effects of changes in the mode of scoring on the scoring profile of university rugby among a panel of VC coaches in a predominantly quantitative fashion, but allowing space for qualitative freedom of expression. By combining the two types of methodology, the effect of changes in the mode of scoring on the scoring profile for South African University rugby were comprehensively resourced and tested, enhancing the interpretability and application of the research findings.

Data collection procedure

Qualitative approach

Semi-structured interviews: Semi-structured interviews were given preference to focus groups for the current study due to the demographic locations of the experts. VC coaches were contacted by means of email and telephone well in advance when the aim of the project and interview were explained in detail. For the coaches to be included in the study, they had to have been involved in coaching at VC level during 2011 and 2012. Based on the information and aim of the study provided, the coaches could accept or decline the invitation. After the initial contact, an interview was scheduled (in person, by telephone or Skype) between the researchers and the coaches. The interviews were semi-structured with four open-end questions. A total of 10 experts were contacted, but only 4 were available for an interview.

Open-ended questions:

1. Based on the law change in 2012, what is your opinion on the law change and how have they changed the scoring profile of VC from your perspective?

2. Based on the law change in 2012, the VC Organising Committee made some intended changes to the scoring profile of the game at VC level. Do you believe this was achieved? Please elaborate.
3. Based on the findings of the quantitative study, how did the law change contribute to change in the scoring profile of VC?
4. Owing to the change in VC rugby since it started in 2008, what other factors or other law changes have contributed to the change in the scoring profile of VC? Please name the factor and elaborate.

Reliability: All the interviews (in person, telephonic or Skype) were audio recorded and transcribed. The transcriptions were checked with the audio files and notes for accuracy. Prior to the start of the semi-structured interviews, a majority opinion was referenced as 80% agreement between the experts. The analysis showed that the strength of the agreement for all the questions was almost perfect.

Quantitative approach

Video footage

Video recordings from all the matches (n=62) of the 2011 and 2012 VC rugby tournaments were recorded and analysed. Matches were analysed using the Dartfish 6.2 TeamPro (5.0, 20909.0) software. Ethical approval (REC-052411-032) was obtained from the Research Ethics Committee: Human Research of the Stellenbosch University.

The VC is an annual inter-university rugby competition involving the top eight South African university teams. The eight teams play in a single round (round robin), followed by a semi-final and a final (play-offs) that determines the National University Champion with home field advantage alternating from one year to the next (www.varsitycup.co.za). The 2011 tournament represented the conventional WR scoring point system, whereas the 2012 tournament, with the amendments to the points (Table 1), represented the modified point scoring system.

Table 1. **MODE OF SCORING AND POINTS VALUE DURING 2011 AND 2012 TOURNAMENTS**

Mode of scoring	Conventional WR for 2011	Modified VC PPS for 2012	Difference
Try or penalty try	5	5	0
Conversion kick	2	3	+1
Penalty kick	3	2	-1
Drop goal	3	2	-1

PSS=Point Scoring System

Coding

This mode of scoring is defined as the method by which points were scored during a match, namely tries, penalty tries, conversion kicks, penalty kicks and drop goals. The collected data

were analysed for the following variables: total points scored, number of tries scored, successful conversion kicks, successful penalty kicks and successful drop goals for each half, as well as for home and away teams. The mode of scoring were analysed by the coding function of the Dartfish software. The video files were viewed and coded in the software's tagging panel. The same analyst analysed all the games so as to prevent inter-rater variability in the different observations and interpretations of activities.

Data analysis

Descriptive data are reported as percentages and frequencies (numbers of observations) with 95% confidence intervals (CI), unless otherwise specified. In addition, if two 95% CI error bars do not overlap and the sample sizes are nearly equal, the difference is statistically significant with a p-value <0.05 (Payton *et al*., 2003). In other words, statistical significant values can be observed between 2011 (traditional scoring method) and 2012 (revised scoring method) for each individual mode of scoring by looking at the 95% CI. Means and standard deviations are reported with Cohen's effect size to show practical differences.

RESULTS

Qualitative analysis

1. Based on the law change in 2012, what is your opinion on the law change and how have they changed the scoring profile of VC from your perspective?

   > Due to the change in the mode of scoring when the attacking teams receives a kickable penalty the trend was that they will kick for touch in order to set-up a line-out to create a try scoring opportunity or they will take a quick penalty kick in order to gain an extra 10 meters rather than to kick for goal. This has led to an increase in the number of successful penalty kicks. (Coach)

2. Based on the law change in 2012, the VC organising committee had some intended changes to the scoring profile of the game at VC level. Do you believe this was achieved?

   > The intention of the trial was to develop a culture of scoring tries and to improve rugby at university level and to improve it as a spectacle at University level rugby in South Africa. More tries were scored during the 2012 season, but it did not improve rugby as a spectacle at university level due to the facets of play used to score these tries. (Coach)

3. Based on the findings of the quantitative study, how did the law change contributed to change in the scoring profile of VC?

   > The attacking teams would rather kick a potentially kickable penalty to touch to create a platform to score a try, so that they have an opportunity to receive 8 points rather than 2 points for a successful penalty kick. This has led to an increase in the number of line-outs and mauls, as well as tries scored from mauls in 2012. This suggests that the teams were using these facets of play as a base to score tries. (Coach)

4. Owing to the change in VC rugby since it started in 2008, what other factors or other law changes have contributed to the change in the scoring profile of VC? Please name the factor and elaborate.

   > Home field advantage: when you play at home you definitely have a psychological advantage over the visiting teams. Due to the competition structure the competition allows for a home team advantage every 2nd year. (Coach)

Quantitative analysis

Overall

The overall scoring profile of the 2011 and 2012 tournaments are presented in Table 2.

Table 2. **SCORING PROFILE OF 2011 AND 2012 FOR ROUND ROBIN AND PLAY-OFF STAGES**

Mode of scoring	2011 Overall	2011 RR	2011 PO	2012 Overall	2012 RR	2012 PO
Tries	189 (169–209)	171 (152–190)	18 (12–24)	234 (213–255)	214 (194–234)	20 (14–26)
Conversion kicks	124 (105–143)	111 (93–129)	13 (7–19)	180 (160–200)	164 (145–183)	16 (10–22)
Penalty kicks	124 (104–143)	112 (94–130)	12 (6–18)	32 (21–43)	31 (21–42)	1 (-1–3)
Drop goal	8 (3–13)	7 (2–12)	1 (1–3)	0	0	0
Total	445	400	44	446	409	37
Average per match	14	14	15	14	15	12

RR=Round robin stages PO=Play off stages

1st and 2nd half

Figure 1 illustrates the range between the conventional (2011) and modified points scoring system (2012) for the 1st and 2nd half of the matches.

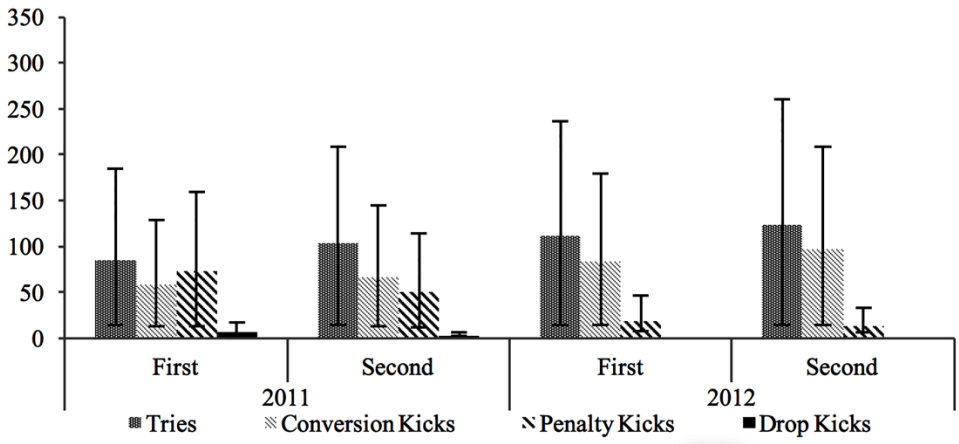

Figure 1. **ILLUSTRATION OF SCORING MODALITIES BETWEEN 1ST AND 2ND HALF OF 2011 AND 2012 MATCHES WITH 95% CI**

In the 1st and 2nd half during the 2011 matches, 778 and 811 points were attained, compared to 842 and 932 points in 2012, respectively. In 2012, the 1st and 2nd half seem to mirror each other with the most prominent mode of scoring being tries, followed by conversion kicks and penalty kicks. Whereas during 2011, 1st half demonstrated 23% more penalty kicks than conversion kicks, which were also 30% more than the 2nd half. The 2nd half of the 2011 matches followed a similar trend as the 2012 1st and 2nd half. Furthermore, the 2012 matches reported no drop goals in comparison with 2011. Both the 2011 and 2012 matches revealed more tries and conversion kicks in the 2nd half compared to the 1st half. However, additional analysis shows that there was a more far-reaching increase in the number of tries from the 1st and 2nd half in 2011 compared to 2012 (22% vs. 11%, respectively), whereas the increase of the number of conversion kicks from the 1st and 2nd half were slightly more in 2012 compared to 2011 (17% vs. 14%, respectively).

The 1st half in 2012 demonstrated a 27% and 35% increase in the number of tries and conversion kicks compared to 1st half in 2011. Conversely, 2011's 1st half showed 117% and 200% more penalty kicks and drop goals in comparison to 2012's 1st half and a similar pattern was found in the 2nd half (119% & 200%). During the 2nd half, the number of tries and conversion kicks increased by 17% and 38% from 2011 to 2012. A similar drop in penalty kicks from the 1st to 2nd half for both 2011 and 2012 (30% and 32%, respectively) were found.

Home vs. away teams

In 2011, the home teams won 12 (39%) of the 31 matches and 20 (65%) in 2012. In 2011, the home teams scored 773 points compared to the 816 points obtained by away teams. In 2012, the opposite was found with home teams scoring 999 points, compared to 775 points for the away teams. Table 3 shows the differences between home and away teams for 2011 and also for 2012 separately, whereas Table 4 compares the home teams between 2011 and 2012, as well as the away teams between 2011 and 2012. In general, when teams played away in 2011 they scored more tries, conversion kicks, penalty kicks and drop goals, than playing at home. In contrast, the teams who played away in 2012 scored significantly less tries and conversion kicks, with no differences in penalty kicks or drop goals.

Table 3. **DIFFERENCES IN NUMBER OF OBSERVATIONS (F) BETWEEN HOME AND AWAY TEAMS FOR 2011 AND 2012**

Home vs. Away teams (*f*)	**2011**	**2012**
Points	↓ 43	↑ 224
Tries	↓ 3	↑ 28
Conversion kicks	↓ 2	↑ 28
Penalty kicks	↓ 6	↔
Drop goals	↓ 2	↔

↓=Home team scored less; ↑=Home team scored more; ↔=No change

When comparing home teams between 2011 and 2012, the home and away teams scored more tries and conversion kicks, and less penalty kicks and drop goals in 2012 compared to 2011.

***Table 4*. DIFFERENCES IN NUMBER OF OBSERVATIONS (*F*) BETWEEN 2011 AND 2012 FOR HOME OR AWAY MATCHES**

2011 vs. 2012	Home (*f*)	% Difference	Away (*f*)	% Difference
Points	↓226	26	↑ 41	5
Tries	↓ 38	34	↓ 7	7
Conversion kicks	↓ 43	52	↓ 13	19
Penalty kicks	↑ 43	115	↑ 49	121
Drop goals	↑ 3	200	↑ 5	200

↓=2011 home team scored less; ↑=2011 home team scored more

Percentage contribution of modes of scoring

Table 1 presented the number of observations with 95% CI for each mode of scoring in 2011 and 2012. Table 5 provides the percentage contribution for each mode of scoring in 2011 and 2012, respectively. On average during the 2011 round robin stages, 51.2±13.5 points were scored when compared to 58±22.7 points in 2012. This is considered a small practical significant difference (d=0.37). On the other hand, a similar point score was observed during the play-offs for 2011 and 2012 (51.7±22.1 vs. 50±27), which is considered as a negligible difference (d=0.08).

***Table 5*. 2011 AND 2012 ROUND ROBIN AND PLAY-OFF STAGES: PERCENTAGE CONTRIBUTIONS FOR EACH MODE OF SCORING**

	2011		2012	
Modes of scoring	RR	PO	RR	PO
Tries	42%	41%	52%	54%
Conversion kicks	28%	30%	40%	43%
Penalty kicks	28%	27%	8%	3%
Drop goal	2%	2%	0%	0%

RR=Round Robin stages PO=Play Off stages

DISCUSSION

This is the first rugby study that specifically focuses on modifying the scoring system at South African University rugby level to determine the changes on game dynamics during match-play. The main findings from the study revealed no changes in the number of modes of scoring used to score points across the two years but in 2012 there was a practical significant increase in the number of tries scored that has led to an increase in the number of successful conversions kicks. A decrease in penalty kicks and drop goals was observed from 2011 to 2012.

Overall

The study revealed no significant differences in the number of modes of scoring used to score points during the 2011 and 2012 seasons. However, *tries* and *successful conversion kicks* increased from 2011 to 2012. The coaches made the following observation during the interviews: when attacking teams receives a kickable penalty the trend was that they will kick for touch in order to set-up a line-out to create a try scoring opportunity or they will take a quick penalty kick in order to gain an extra 10 metres. A decrease in *successful penalty kicks* and *drop goals* was observed in 2012 when comparing it with 2011. However, there was an increase in the number of penalty kicks awarded in 2012 and more yellow cards awarded for repeated infringements from the defending teams. This indicates that defending teams would rather concede a penalty than have a try scored against them. The attacking teams would rather kick a potentially kickable penalty to touch to create a platform to score a try, in order to have an opportunity to receive 8 points rather than 2 points for a successful penalty kick. Interestingly, the coaches observed an increase in the number of line-outs and mauls, as well as tries scored from successful mauls. This suggested that the teams were using these facets of play to score tries.

1st and 2nd half

In both 2011 and 2012, the most points were accumulated during the 2nd half of the match. In 2011, penalty kicks were more prominent in the 1st half compared to the 2nd half of the matches. A possible reason for this is that the 1st half is more of an opportunity game, in which teams try to score as many points as possible, compared to the strategic 2nd half in which teams know what they have to do in order to win the match. The 2012 season followed a similar but less pronounce trend as 2011. During 2012, 27 more tries were scored during the 2nd half of the match when comparing the 1st and 2nd half of match-play. Similar trends were revealed in soccer by Mitrotasios and Armatas (2014) where during the European Soccer Champions in 2012, 58% of the goals were scored in the 2nd half and 21% of them in the last 15-minute period. Firstly, it was suggested that goals scored were not time dependent. Although no statistical difference was observed that more goals scored in the 2nd half of the matches, while 15-minute period analysis revealed that more goals were scored in the beginning and in the end of the 2nd half.

Home vs. away teams

No significant differences were found between the performance of home and away teams during the 2011 season. However, it was different in 2012 as the home teams won 65% of their matches. An explanation for this can be that in 2011 the stronger teams might have played all the weaker teams away and this might have changed in 2012, where they played all the weaker teams at home. Similar trends were revealed by Morton (2006) who found that during the 2000–2004 Super 12 tournament the teams that possess a high home advantage the one year do not tend to carry it over into the next year, neither does a team with a home disadvantage tend to carry it over. The study by Morton (2006) further revealed that the stronger teams based on rankings do not necessarily have a high home advantage. The coaches felt that when you play at home, you definitely had a psychological advantage over the visiting teams, but away teams can use this as an advantage. Typically, away teams will try and score points early during the match in order to put pressure on the home team. However, the coaches believe that the competition allows for a home team advantage every 2nd year.

Percentage contribution of modes of scoring

When comparing the percentage contribution for the different modes of scoring across each of the round stages of the competition, no convincing difference was revealed. However, when comparing the modes of scoring across the different competition stages and across the two years, the study revealed practical significant differences. When comparing the round robin with the play-off stages in 2011, the study revealed an increase in conversion kicks and decrease in number of tries scored and no difference for penalty kicks and drop goals. Play-off stage matches are normally closely contested. The difference between a win and loss might be small. The findings indicated that teams were more successful in conversion kicks during the play-off stages. In 2012 when comparing the round robin with the play-off stages, the findings of the study revealed an increase in the number of tries scored and conversion kicks and a decrease in penalty kicks and no difference for drop goals. When comparing the round robin stages between 2011 and 2012, there was an increase in tries scored and conversion kicks and a decrease in penalty kicks and drop goals. When comparing the play-off stages, a similar trend was emerged with an increase in tries and conversion kicks and a decrease in penalty kicks and drop goals.

PRACTICAL APPLICATION

With the current point's system and match trends, the coaches identified the following areas to be prioritised by coaches in order to achieve success in the VC tournament.

- Have an effective kicker to get distance on touch kicks in order to set-up an attacking line-out;
- Have effective set-up skills at set pieces (specially line-outs);
- Create good mauling skills to use mauls as a try scoring base;
- Have discipline on attack and defence to minimise infringements (conceding penalties);
- Develop effective contesting strategies and skills at line-outs to disrupt the attacking team from receiving a clean ball;
- Have an effective strategy to stop attacking mauling without conceding a penalty;
- Develop patterns of play that use combinations of these skills and tactics.

CONCLUSION

The intention of the trial was to develop a culture of scoring tries and to improve rugby as a spectacle at University level rugby in South Africa. The changes in laws showed that more tries were scored, however, the question remains whether rugby at university level improved as a spectacle. The interviews with the coaches revealed that it was clear that the game at University level did not improve as a spectacle. Based on the qualitative and quantitative findings of the study, the authors suggest the following to the organising committee of the VC rugby tournament to *cement a culture of scoring tries* and a *spectacle* at University level rugby in South Africa: (a) each team should only be allowed to kick 8 penalties to touch per match and this can further be divided into 4 per half; and (b) each team is only allowed to use the maul 6 times per match from line-outs and this might be further divided into 3 mauls per half. These suggestions to the change in laws will require more strategising and decision-making

from the captain and teams to use other facets of play as a base to score tries, thus improving rugby as a spectacle for supporters at university level rugby.

Acknowledgement

The authors wish to thank the coaches of the VC teams for their participation in the study.

REFERENCES

ARIAS, J.L.; ARGUDO, F.M. & ALONSO, J.L. (2011). Review of rule modification in sport. *Journal of Sport Science and Medicine*, 10(1): 1-8.

BELL, W.; COBNER, D.; COOPER, S.M. & PHILIPS, S. J. (1993). Anaerobic performance and body-composition of International Rugby Union players. In T. Reilly, J. Clarys, A. Stibbe (Eds.), *Science and Football II* (pp. 15-20). London, UK: E. & F.N. Spon.

DU PREEZ, M. & LAMBERT, M.L. (2007). Travel fatigue and home ground advantage in South African Super 12 rugby teams. *South African Journal of Sports Medicine*, 19(1): 20-22.

EAVES, S.J.; HUGHES, M.D. & LAMB, K.L. (2008). Assessing the impact of the season and rule changes on specific match and tactical variables in professional rugby league football in the United Kingdom. *International Journal of Performance Analysis in Sport*, 8(3): 104-118.

CARRON, A.; LOUGHEAD, T. & BRAY, S. (2005). The home advantage in sports competitions: Courneya and Carron's (1992) conceptual framework a decade later. *Journal of Sports Sciences*, 23(4): 395-407.

COURNEYA, K. & CARRON, A. (1992). The home advantage in sports competitions: A literature review. *Journal of Sport and Exercise Psychology*, 14(1): 13-27.

COUGHLAN, G.F.; GREEN, B.S.; POOK, P.T.; TOOLAN, E. & O'CONNOR, S.P. (2011). Physical game demands in Elite Rugby Union: A global positioning system analysis and possible implications for rehabilitation. *Journal of Orthopaedic and Sports Physical Therapy*, 41(8): 600-605.

DE VOS, A.S. (Ed.); STRYDOM, H.; FOUCHE, C.B. & DELPORT, C.S.L. (2005). *Research at grass roots the social science and human service professions* (2nd ed.). Pretoria, South Africa: Van Schaik.

FULLER, C.W.; RAFTERY, M.; READHEAD, C.; TARGETT, S.G.R. & MOLLY, M.G. (2009). Impact of the International Rugby Board's experimental law variations on the incidence and nature of match injuries in southern hemisphere Professional Rugby Union. *South African Medical Journal*, 99(4): 232-237.

GABBETT, T.J. (2000). Physiological and anthropometric characteristics of amateur Rugby League players. *British Journal of Sports Medicine*, 34(4): 303-307.

KERR, J.H. & VAN SCHAIK, P. (1995). Effects of game venue and outcome on psychological mood states in rugby. *Personality and Individual Differences*, 19: 407-410.

KRAAK, W.J. & WELMAN, K.E. (2014). Ruck-play as performance indicator during the 2012 Six Nations Championship. *International Journal of Sports Science & Coaching*, 9(3): 525-537.

LIM, E.; LAY, B.; DAWSON, B.; WALLMAN, K. & ANDERSON, S. (2011). Predicting try scoring in super 14 rugby union: The development of a superior attacking team scoring system. *International Journal of Performance Analysis in Sport*, 11(3): 464-475.

MADDEN, T. (2000). Rugby: Skills, tactics and rules. *Library Journal*, 125(19): 77-77.

MORTON, R.H. (2006). Home advantage in southern hemisphere Rugby Union: National and international**.** *Journal of Sports Sciences*, 24(5): 495-499.

NEVILL, A.M. & HOLDER, R.L. (1999). Home advantage in sport: An overview of studies on the advantage of playing at home. *Sport Medicine*, 28(4): 221-236.

PAYTON, M.E.; GREENSTONE, M.H. & SCHENKERK, N. (2003). Overlapping confidence intervals or standard error intervals: What do they mean in terms of statistical significance? *Journal of Insect Science*, 3(34): 1-6.

POLLARD, R. (2006). Worldwide regional variations in home advantage in association football. *Journal of Sports Sciences*, 24(3): 231-240.

THOMAS, S.; REEVES, C. & BELLHORME, A. (2008). Advantage in the Six Nations Rugby Union tournament. *Perceptual and Motor Skill*, 106(1): 113-116.

STEFANI, R. (2009). Predicting score difference versus score total in rugby and soccer. *IMA (Institute of Mathematics and its Applications) Journal of Management Mathematics*, 20(2): 147-158.

MITROTASIOS, M. & ARMATAS, V. (2014). Analysis of goal scoring patterns in the 2012: European Football Championship. *The Sport Journal*, 1(January): 1-11.

ORTEGA, E.; VILLAREJO, D. & PALAO, J.M. (2009). Differences in game statistics between winning and losing rugby teams in the Six Nations Tournament. *Journal of Sports Science and Medicine*, 8(4): 523-527.

QUARRIE, K.L. & HOPKINS, W.G. (2007). Changes in player characteristics and match activities in Bledisloe Cup rugby union from 1972 to 2004. *Journal of Sports Sciences*, 25(8): 895-903.

VAHED, Y.; KRAAK, W. & VENTER, R. (2014). The effect of the law changes on time variables of the South African Currie Cup Tournament during 2007 and 2013. *International Journal of Performance Analysis of Sport*, 14(3): 866-883.

VAN ROOYEN, M.K.; LAMBERT, M.I. & NOAKES, T.D. (2006). A retrospective analysis of the IRB statistics and video analysis of match play to explain the performance of four teams in the 2003 Rugby World Cup. *International Journal of Performance Analysis in Sport*, 6(1): 57-72.

VAZ, L.; MOUCHET, A.; CARRERAS, D. & MORENTE, H. (2011). The importance of rugby game-related statistics to discriminate winners and losers at the elite level competitions in close and balanced games. *International Journal of Performance Analysis in Sport*, 11(1): 130-141.

VAZ, L.; VAN ROOYEN, M. & SAMPAIO, J. (2010). Rugby game-related statistics that discriminate between winning and losing teams in IRB and Super Twelve close games. *Journal of Sports Science and Medicine*, 9(1): 51-55.

WILLIAMS, J.; HUGHES, M.D. & O'DONOGHUE, P. (2005). The effect of rule changes on match and ball-in-play time in Rugby Union. *International Journal of Performance Analysis in Sport*, 5(3): 1-11.

Corresponding author: Dr Wilbur Kraak; **Email:** kjw@sun.ac.za

(Subject editor: Dr Riaan Schoeman)