



Impact of the International Rugby Board's experimental law variations on the incidence and nature of match injuries in southern hemisphere professional rugby union

Colin W Fuller, Martin Raftery, Clint Readhead, Stephen G R Targett, Michael G Molloy

Objective. To examine the epidemiology of match injuries in southern hemisphere professional rugby union and assess the impact of the International Rugby Board (IRB) Experimental Law Variations.

Setting. One-season whole population prospective cohort.

Subjects. Twenty-seven teams (813 players) taking part in the 2008 Super 14 and Vodacom Cup competitions.

Outcome measures. Incidence, severity, location, type and cause of injury.

Results. The incidence in the Super 14 competition (96.3 injuries/1 000 player-match hours; 95% confidence interval (CI) 69.0 - 111.7) was significantly higher ($p=0.003$) than that in the Vodacom Cup (71.2; CI 60.0 - 84.5); injury severity was significantly lower ($p<0.001$) in the Super 14 (mean 13.4 days; median 5) than the Vodacom Cup (mean 21.2; median 12). There were no significant differences between the two competitions in type or location of injury: lower limb muscle/

tendon (Super 14: 27.8%; Vodacom Cup: 25.7%) and joint (non-bone)/ligament (Super 14: 18.8%; Vodacom Cup: 24.3%) were the most common injuries. Injury causation was similar for the two competitions but there were significantly fewer ruck/maul ($p=0.001$) and more tackled ($p=0.010$) injuries in Super 14 compared with English Premiership rugby and fewer collision ($p=0.002$) and more tackling ($p<0.001$) injuries compared with Rugby World Cup. In the Vodacom Cup, there were significantly more tackling ($p<0.001$) injuries compared with Rugby World Cup.

Conclusion. The incidence, nature and causes of injuries in southern hemisphere professional club rugby played under IRB Experimental Law Variations were similar to those for professional club rugby in the northern hemisphere and Rugby World Cup played under the previous Laws of Rugby.

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Rugby union is a contact team sport played throughout the world by adults and children of all ages. The popularity of the sport is due to the physical nature of the game and also its ability to offer roles for athletes of all shapes and sizes (IRB, 2008).¹ The sport attracts widespread spectator support, which is due in part to the worldwide media attention afforded to the International Rugby Board's (IRB) Rugby World Cup (RWC) and to professional club competitions staged in northern and southern hemisphere countries. In 2004, the IRB established a Laws Project Group to review the existing Laws of the Game¹ with the aim of identifying ways in which the appeal of the

game could be enhanced. This review resulted in a range of proposals, referred to as Experimental Law Variations (ELV). The efficacy of these proposals was initially assessed by the IRB during 2007 in a number of minor competitions in northern and southern hemisphere countries. The main technical evaluation of the proposed law changes was conducted during the 2008 Tri-nations, Super 14, Currie Cup and Vodacom Cup competitions in the southern hemisphere.

Additionally, it is essential that the risk of injury to players is also monitored as part of the ELV evaluation process because of the high incidence of match injuries in rugby union. For international rugby, incidence of injury was recorded as 98 missed-match and medical treatment injuries/1 000 player-match hours at RWC 2003,² and 84 time-loss injuries/1 000 player-match hours at RWC 2007.³ A northern hemisphere, two-season epidemiological study from 2002 to 2004 of 12 professional teams in the English Premiership⁴ reported 91 time-loss injuries/1 000 player-match hours. Studies in the southern hemisphere reported 120 time-loss and medical treatment injuries/1 000 player-match hours for one New Zealand Super 12 professional team during the 1997 season,⁵ and 55 time-loss and medical treatment injuries/1 000 player-match hours for three South African Super 12 professional teams during the 1999 season.⁶ These southern hemisphere studies were conducted prior to the publication of the consensus agreement on definitions and procedures for injury surveillance studies in rugby,⁷ so the first aim of this study was

Centre for Sports Medicine, University of Nottingham, Nottingham, UK

Colin W Fuller, PhD

Australian Rugby Union, Sydney, Australia

Martin Raftery, MB

South African Rugby Union, Newlands, Cape Town

Clint Readhead, BSc

New Zealand Rugby Union, Wellington, New Zealand

Stephen G R Targett, MB

International Rugby Board, Dublin, Ireland

Michael G Molloy, MB

Corresponding author: C Fuller (colin.fuller@nottingham.ac.uk)



to characterise the incidence, nature and causes of injury in the Super 14 and Vodacom Cup competitions using the consensus-recommended protocols. The second aim was to evaluate the impact on match injuries of the IRB ELVs that were implemented at different levels during these two competitions.

Methods

Players from the 14 teams (Australia: 4; New Zealand: 5; South Africa: 5) involved in the 2008 Super 14, and 13 of the 14 teams involved in the 2008 Vodacom Cup in South Africa, took part in the study. In total, 813 players (Super 14: 441; Vodacom Cup: 372) were included. The two competitions took place concurrently over the period February - May 2008; all proposed ELVs were implemented during the Vodacom Cup, and a limited number during the Super 14 competition.⁸ Some ELVs related to 'administrative' issues, such as the role of the assistant referee and the re-emphasis of existing laws of the game; some related to 'procedural' issues, such as the re-categorisation of penalty offences to free-kick offences and the designation of off-side lines; and others related to 'technical' issues, such as defending players not being allowed to pass or carry the ball back behind their 22-metre line before kicking the ball directly to touch, and quick lineout throws that can be thrown towards the defenders' goal line. While these ELVs are unlikely to have a direct impact, they may have an indirect impact on the incidence of injury, as the speed of the game and the ball in play time could be affected. Some changes, however, related to 'player-contact' situations where there could potentially be a direct impact on the risk of injury to players. Proposals falling into this latter category and the competitions in which these changes were implemented, concerned:

Lineout:

- no restrictions on the number of players in the lineout (Vodacom Cup)
- players may pre-grip and lift lineout jumpers (Super 14 and Vodacom Cup)

Tackle/post-tackle:

- players on their feet may play the ball with their hands (Vodacom Cup)

Maul:

- defending players may pull down a maul (Vodacom Cup).

A detailed manual describing the aims, definitions and procedures for the study, and containing injury report forms, was prepared and distributed to the medical staff of each participating team before the start of the two competitions. Definitions and procedures described in the manual were consistent with the consensus statement for injury surveillance studies in rugby union.⁷ Members of the three national rugby unions involved in the study also acted as local study co-ordinators and liaised with teams from their respective

countries. Ethical approval for the study was received from the University of Nottingham Medical School Research Ethics Committee.

Players' baseline information (age in years, free-standing stature in cm, body mass in kg and normal playing position) and consent for data to be included in the study were collected prior to the start of the competitions. An injury was defined as 'any injury sustained during a Super 14 or Vodacom Cup match that prevented the player from taking a full part in all training activities planned for that day and/or match play for more than one day following the day of injury'. Injuries were classified by location, type, Orchard Code⁹ or diagnosis and number of days' absence from playing/training together with the player's playing position, period in the game and the activity involved at the time of injury. When required, injuries were followed up post-tournament by the national study co-ordinators to confirm injured players' return to play/training dates. The number of matches that players missed in the tournaments as a result of time-loss injuries was also recorded. Injuries sustained by players during training activities and absences due to illness and non rugby-related medical conditions were not included in the study. Match exposures were calculated on the basis of 15 players (forwards: 8; backs: 7) per team exposed for 80 minutes per team-game. No allowance was made for a player's temporary or permanent removal from the game for foul play or the treatment of bleeding injuries.

Data analysis

A sample size calculation indicated that match exposures of 2 400 player-hours in each competition would be sufficient to identify a 33% difference in the incidence of time-loss injuries between the competitions with 90% power and 95% confidence. Players' baseline data were reported as means (standard deviation); incidences as injuries/1 000 player-match hours (95% confidence interval (CI)); distributions as percentages (95% CI); and severities as mean and median values and grouped within the categories of minimal (2 - 3 days), mild (4 - 7 days), moderate (8 - 28 days) and severe (>28 days), as defined in the rugby consensus statement.⁷ Differences in values between groups were assessed using the unpaired *t*-test for anthropometric measurements, *z*-values for the rate ratio of injury incidence, *z*-values for difference in proportions, and the Mann-Whitney test for injury severity.¹⁰ Because of the large number of comparisons undertaken in this study, significance was established at $p < 0.01$. Wherever possible, data collected in this study were compared with the equivalent results published for the English Premiership⁴ and the Rugby World Cup 2007,³ as the results in these studies were collected using similar protocols to that in the present study and because they related to a similar elite standard of professional rugby.



Results

Table I shows the mean age, stature and body mass of the players in the two competitions, together with equivalent data for the English Premiership and Rugby World Cup. Super 14 players were significantly older (forwards: $p<0.001$; backs: $p=0.019$), taller (forwards: $p<0.001$; backs: $p<0.001$) and heavier (forwards: $p=0.007$; backs: $p<0.001$) than Vodacom Cup players. Compared with English Premiership players, Super 14 players were younger ($p=0.012$), taller ($p=0.003$) and heavier ($p=0.003$), whereas Vodacom Cup players were younger ($p<0.001$), shorter ($p<0.001$) and lighter ($p<0.001$). Compared with RWC players, Super 14 players were younger ($p<0.001$) but were similar in stature ($p=0.280$) and body mass ($p=0.889$), whereas Vodacom Cup players were significantly ($p<0.001$) younger, lighter and shorter.

Included in the study were 280 team-games (Super 14: 188; Vodacom Cup: 92), which equated to 5 600 player-match hours (Super 14: 3 760; Vodacom Cup: 1 840). This exposure resulted in 493 time-loss injuries (Super 14: 362; Vodacom Cup: 131) and 179 missed-match injuries (Super 14: 105; Vodacom Cup: 74); no fatal or catastrophic spinal injuries were recorded during either competition. Table II summarises the incidences of injuries for both competitions and the English Premiership and Rugby World Cup. Although the overall incidence of injury in the Super 14 competition was significantly higher ($p=0.003$) than in the Vodacom Cup, there were no significant differences between the competitions when forwards and backs were compared separately. The incidence of missed-match injuries was lower in the Super 14 competition (27.9 (95% CI: 23.2 - 33.8) injuries/1 000 player-match hours) compared with the

Table I. Mean (standard deviation) of anthropometric data as a function of playing position and competition

Playing position	Age (years)	Stature (cm)	Body mass (kg)
Super 14 (N=441)	24.7 (3.2)	186.5 (7.2)	102.3 (11.8)
Forwards (N=247)	25.0 (3.2)	189.8 (6.9)	110.7(7.3)
Backs (N=194)	24.3 (3.1)	182.4 (5.2)	91.7 (6.6)
Vodacom Cup (N=372)	23.8 (2.9)	183.4 (8.5)	98.3 (14.2)
Forwards (N=201)	24.0 (2.8)	187.2 (9.0)	108.5 (9.4)
Backs (N=171)	23.5 (3.0)	179.1 (5.4)	86.2 (7.8)
English Premiership (N=534)*	25.3 (4.1)	185.1 (7.4)	100.0 (12.1)
Forwards (N=291)	25.8 (4.2)	188.1 (7.4)	108.5 (8.1)
Backs (N=243)	24.7 (3.8)	181.3 (5.4)	89.5 (6.7)
Rugby World Cup (N=626)†	27.6 (3.5)	186.0 (7.6)	102.2 (12.6)
Forwards (N=342)	28.1 (3.4)	189.0 (7.3)	110.8 (8.5)
Backs (N=284)	26.9 (3.5)	182.3 (6.2)	91.9 (8.2)

*Data from Brooks *et al.*⁴

†Data from Fuller *et al.*³

Table II. Incidence of injuries (injuries/1 000 player-match hours) as a function of playing position and competition

Competition/players	Incidence (95% CI)	Rate ratio (95% CI) compared with the English Premiership	p-value	Rate ratio (95% CI) compared with the RWC	p-value
Super 14					
Forwards	90.3 (78.0 - 104.4)	0.98 (0.83 - 1.15)	0.810	1.08 (0.83 - 1.39)	0.582
Backs	103.2 (89.2 - 119.3)	1.14 (0.97 - 1.34)	0.121	1.23 (0.94 - 1.61)	0.126
All players	96.3 (86.9 - 106.7)	1.05 (0.94 - 1.18)	0.373	1.15 (0.95 - 1.38)	0.144
Vodacom Cup					
Forwards	65.2 (51.0 - 83.3)	0.71 (0.55 - 0.91)	0.008	0.78 (0.56 - 1.07)	0.126
Backs	78.0 (61.4 - 99.1)	0.86 (0.67 - 1.10)	0.238	0.93 (0.67 - 1.30)	0.674
All players	71.2 (60.0 - 84.5)	0.78 (0.65 - 0.93)	0.006	0.85 (0.67 - 1.07)	0.165
English Premiership*					
Forwards	92.1 (86.0 - 98.6)	-	-	1.10 (0.88 - 1.37)	0.412
Backs	90.7 (84.3 - 97.6)	-	-	1.08 (0.86 - 1.37)	0.503
All players	91.4 (86.9 - 96.1)	-	-	1.09 (0.93 - 1.28)	0.276
Rugby World Cup†					
Forwards	84.0 (68.0 - 103.8)	0.91 (0.73 - 1.14)	0.412	-	-
Backs	83.7 (66.8 - 105.0)	0.92 (0.73 - 1.17)	0.503	-	-
All players	83.9 (71.9 - 97.9)	0.92 (0.78 - 1.08)	0.298	-	-

*Data from Brooks *et al.*⁴

†Data from Fuller *et al.*³



Vodacom Cup (40.2 (95% CI: 32.0 - 50.5)) but the difference was not significant ($p=0.016$). There were no significant differences in the incidence of injury for the Super 14 competition compared with the English Premiership and Rugby World Cup; but for the Vodacom Cup, the overall incidence of injury was significantly lower than that observed in the English Premiership, which was the result of the significantly lower incidence of injury observed for forwards in the Vodacom Cup.

There was a significant difference in the severity of injuries between the two competitions (Super 14: mean 13.4, median 5; Vodacom Cup: mean 21.2, median 12; $p<0.001$). The incidences of injury as a function of grouped severity for the two competitions and the RWC are shown in Table III; equivalent data were not available for the English Premiership. Compared with the RWC, the incidence of minimal injuries was significantly higher in the Super 14 and significantly lower in the Vodacom Cup.

Table IV provides a cross-tabulation of the location and type of injuries for both competitions; there were no significant differences in the nature of the injuries sustained between the two competitions or in comparison with the English Premiership or the RWC. The most common injuries in both

competitions were lower limb muscle/tendon (Super 14: 27.8%; Vodacom Cup: 25.7%; $p=0.708$) and lower limb joint (non-bone)/ligament (Super 14: 18.8%; Vodacom Cup: 24.3%; $p=0.285$). The five most commonly reported injuries across the two competitions were concussion (9.7%), ankle ligament (8.7%), quadriceps haematoma (5.9%), knee ligament (5.4%) and hamstring muscle strain (4.7%) injuries.

Table V shows the distributions of injuries as a function of the type of contact event causing the injuries in both competitions, the English Premiership and the RWC. There were no significant differences between the two competitions. Compared with the English Premiership, there were significantly fewer ruck/maul ($p=0.001$) and more tackle ($p=0.010$) injuries in the Super 14. Compared with the RWC, there were significantly fewer collision ($p=0.002$) and more tackling ($p<0.001$) injuries in the Super 14, and more tackling ($p<0.001$) injuries in the Vodacom Cup.

Discussion

The Super 14 competition comprises the leading professional club rugby players from Australia, New Zealand and South

Table III. Incidence (injuries/1 000 player-hours) of injury as a function of grouped injury severity and competition

Injury severity group	RWC 2007*	Incidence (95% CI)	Super 14	<i>p</i> -value	Vodacom Cup	Rate ratio (95% CI) compared with RWC	<i>p</i> -value
	Incidence (95% CI)		Rate ratio (95% CI) compared with RWC		Incidence (95% CI)		
Minimal (2 - 3 days)	20.8 (15.3 - 28.4)	38.8 (33.0 - 45.7)	1.87 (1.31 - 2.65)	<0.001	7.1 (4.1 - 12.2)	0.34 (0.18 - 0.64)	<0.001
Mild (4 - 7 days)	24.5 (18.4 - 32.6)	26.3 (21.6 - 32.1)	1.07 (0.76 - 1.52)	0.689	14.1 (9.6 - 20.8)	0.58 (0.36 - 0.93)	0.014
Moderate (8 - 28 days)	23.4 (17.5 - 31.4)	18.9 (15.0 - 23.8)	0.81 (0.56 - 1.17)	0.263	34.8 (27.2 - 44.4)	1.49 (1.02 - 2.18)	0.041
Severe (>28 days)	15.1 (10.5 - 21.7)	12.2 (9.2 - 16.3)	0.81 (0.51 - 1.29)	0.368	15.2 (10.5 - 22.0)	1.01 (0.60 - 1.69)	0.984
All severities	83.9 (71.9 - 97.9)	96.3 (86.9 - 106.7)	1.15 (0.95 - 1.38)	0.144	71.2 (60.0 - 84.5)	0.85 (0.67 - 1.07)	0.165

*Data from Fuller *et al.*³

Table IV. Cross tabulation of location and type of injury as a function of competition

Injury type	Injury location, % (95% CI)				
	Head/neck	Upper limb	Trunk	Lower limb	All
Super 14 (N=345)					
Bone	1.2 (0.0 - 2.3)	1.7 (0.4 - 3.1)	0.6 (0.0 - 1.4)	1.4 (0.2 - 2.7)	4.9 (2.6 - 7.2)
Joint (non-bone)/ligament	3.2 (1.3 - 5.0)	12.2 (8.7 - 15.6)	5.5 (3.1 - 7.9)	18.8 (14.7 - 23.0)	39.7 (34.5 - 44.9)
Muscle/tendon	2.3 (0.7 - 3.9)	5.5 (3.1 - 7.9)	3.2 (1.3 - 5.0)	27.8 (23.1 - 32.6)	38.8 (33.7 - 44.0)
Skin	3.2 (1.3 - 5.0)	0.3 (0.0 - 0.9)	0.3 (0.0 - 0.9)	0.3 (0.0 - 0.9)	4.1 (2.0 - 6.1)
Brain/spinal cord/PNS	11.0 (7.7 - 14.3)	0.6 (0.0 - 1.4)	0.0 (-)	0.3 (0.0 - 0.9)	11.9 (8.5 - 15.3)
Other	0.3 (0.0 - 0.9)	0.3 (0.0 - 0.9)	0.0 (-)	0.0 (-)	0.6 (0.0 - 1.4)
All types	21.2 (16.8 - 28.5)	20.6 (16.3 - 24.8)	9.6 (6.5 - 12.7)	48.7 (43.4 - 54.0)	100.0
Vodacom Cup (N=74)					
Bone	0.0 (-)	2.7 (0.0 - 6.4)	1.4 (0.0 - 4.0)	1.4 (0.0 - 4.0)	5.4 (0.3 - 10.6)
Joint (non-bone)/ligament	1.4 (0.0 - 4.0)	10.8 (3.7 - 17.9)	2.7 (0.0 - 6.4)	24.3 (14.5 - 34.1)	39.2 (28.1 - 50.3)
Muscle/tendon	2.7 (0.0 - 6.4)	10.8 (3.7 - 17.9)	1.4 (0.0 - 4.0)	25.7 (15.7 - 35.6)	40.5 (29.4 - 51.7)
Skin	0.0 (-)	0.0 (-)	0.0 (-)	0.0 (-)	0.0 (-)
Brain/spinal cord/PNS	13.5 (5.7 - 21.3)	0.0 (-)	0.0 (-)	0.0 (-)	13.5 (5.7 - 21.3)
Other	0.0 (-)	0.0 (-)	1.4 (0.0 - 4.0)	0.0 (-)	1.4 (0.0 - 4.0)
All types	17.6 (8.9 - 26.2)	24.3 (14.5 - 34.1)	6.8 (1.0 - 12.5)	51.4 (40.0 - 62.7)	100.0



Table V. Proportion (95% CI) of contact injuries as a function of match activity and competition

Match activity	English Premiership*		Super 14 Proportion, % (95% CI)	<i>p</i> -value compared with Premiership RWC		Vodacom Cup Proportion, % (95% CI)		<i>p</i> -value compared with Premiership RWC	
	Premiership*	RWC 2007 [†]							
Collision	11.9 (10.1 - 13.8)	23.0 (15.5 - 30.4)	11.4 (7.6 - 15.1)	0.795	0.002	14.1 (5.5 - 22.6)	0.610	0.150	
Lineout	0.8 (0.3 - 1.3)	0.8 (0.0 - 2.4)	0.7 (0.0 - 1.7)	0.865	0.928	3.1 (0.0 - 7.4)	0.066	0.234	
Ruck/maul	22.8 (20.4 - 25.1)	23.7 (16.2 - 31.3)	13.9 (9.8 - 18.0)	0.001	0.016	17.2 (7.9 - 26.4)	0.298	0.298	
Scrum	4.3 (3.1 - 5.4)	6.6 (2.2 - 10.9)	5.9 (3.1 - 8.6)	0.263	0.787	1.6 (0.0 - 4.6)	0.289	0.131	
Tackled	33.2 (30.5 - 35.9)	35.2 (26.8 - 43.7)	41.4 (35.5 - 47.2)	0.010	0.250	32.8 (21.3 - 44.3)	0.952	0.741	
Tackling	21.1 (18.8 - 23.4)	10.7 (5.2 - 16.1)	26.7 (21.5 - 32.0)	0.042	<0.001	31.3 (19.9 - 42.6)	0.055	<0.001	
Other contact	5.9 (4.6 - 7.3)	-	-	-	-	-	-	-	-

*Data from Brooks *et al.*⁴[†]Data from Fuller *et al.*³

Africa, and it represents a similar standard of play to the Premiership in England; the Vodacom Cup involves the second tier of professional players in South Africa. Although there were significant differences in players' anthropometric measurements between the two competitions and compared with the English Premiership and RWC, the differences in absolute terms were small when compared, for example, with the differences between these players and elite 18-year-old South African rugby players¹¹ (stature: 179.2 cm, $p < 0.001$; body mass: 84.9 kg, $p < 0.001$). For the purposes of this study, the players from both competitions were regarded as being of similar stature and body mass to players from the English Premiership and Rugby World Cup.

Previous studies of southern hemisphere professional rugby teams used different definitions of injury from the present study, which followed the recommendations of the rugby consensus statement;⁷ this made direct comparisons of the present study with these earlier studies difficult or impossible. However, Targett⁵ reported an incidence of 45 (95% CI: 27 - 76) missed match injuries/1 000 player-match hours for one New Zealand Super 12 team, and Holtzhausen *et al.*⁶ reported a value of 31 (95% CI: 21 - 47) for three South African Super 12 teams. These values were not significantly different from the results reported here for missed-match injuries in both the Super 14 and Vodacom Cup. The incidence of time-loss injuries reported here for the Super 14 competition was similar to the incidence of time-loss injuries reported previously for English Premiership teams,⁴ although the incidence in the Vodacom Cup was significantly lower. The results for both the Super 14 and the Vodacom Cup competitions were similar to the results reported for RWC 2007.³

Injuries reported in the Vodacom Cup were significantly more severe than those reported in the Super 14 competition; this was mainly due to the higher incidences of minimal and mild injuries reported by Super 14 teams compared with Vodacom Cup teams. Comparisons of injury severity with previous Super 12 studies were not possible, as mean and median severity values were not published for either

study.^{5,6} The severity values reported in the present study, however, compare closely with the mean values of 18 and 15 days reported for the English Premiership⁴ and RWC 2007³ respectively and the median value of 7 days reported for the RWC 2007.³

There were no significant differences in the nature of injuries sustained in the Super 14 and Vodacom Cup competitions, with the highest proportions of injuries in both competitions being lower limb muscle/tendon and joint (non-bone)/ligament injuries. It was not possible to compare the present results with previous studies of Super 12 competitions, as diagnoses for match and training injuries were grouped together in both the earlier studies. There were, however, no significant differences in the nature of injuries in either competition compared with equivalent results reported for the English Premiership⁴ and the RWC.³ The five most common injuries in the present study included the three most common injuries reported for English Premiership rugby⁴ (thigh haematoma, 8.8%; hamstring muscle strain, 6.2%; concussion, 4.8%) and RWC 2007³ (ankle ligament, 9.9%; knee ligament, 9.9%; hamstring muscle strain, 9.9%). The tackle was the most common cause of injury in both competitions, which is consistent with previous reports in English professional rugby.¹² The major differences in injury causation in the Super 14 were significantly fewer ruck/maul and more tackled injuries compared with the English Premiership, and significantly fewer collision and more tackling injuries compared with RWC. For the Vodacom Cup, there were significantly more tackling injuries compared with the RWC. Overall, the incidence, nature and causes of match injuries in the two southern hemisphere competitions were similar to those reported previously for teams competing in the English Premiership and Rugby World Cup.

The Super 14 and Vodacom Cup competitions covered by the present study were played under the ELVs⁸ introduced by the IRB. Benchmark data for the incidence and nature of injuries prior to the introduction of the ELVs were not available for either of these competitions. However, analyses of the results from the present study indicated that the risks and causes of



injury in both competitions were similar to those experienced in the English Premiership and RWC 2007, which were played under the existing IRB Laws of the Game.¹ The 2008 Super 14 competition implemented only one ELV that could be construed as directly affecting the level of physical contact (pre-gripping and lifting players in a lineout) and hence the risk of injury, although other ELVs may indirectly have an impact on the incidence of injury because time in play may increase. The study therefore indicated that the ELVs falling into the 'administrative', 'procedural' and 'technical' categories implemented in this competition did not have an adverse effect on the incidence, nature or causes of injury. The 2008 Vodacom Cup, on the other hand, implemented all of the proposed IRB ELVs, but the incidence of injury recorded in this competition was significantly lower than those recorded in the Super 14, the English Premiership and the Rugby World Cup. While this fact may simply reflect a lower standard of play, most of the difference can be accounted for by the significantly lower incidence of injuries recorded in the minimal injury severity category, as there were no other major differences. There were no indications that more injuries were caused in lineout, ruck/maul or tackled situations as a result of changes made within the ELVs. It is therefore possible to conclude that the IRB ELVs implemented during the 2008 Super 14 and Vodacom Cup did not significantly increase the risk of injury to players. Further studies with even greater statistical power are required, however, to investigate the effect of ELVs on specific injuries and the effect of each individual ELV.

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