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DEFENSIVE STRATEGIES IN RUGBY UNION[1, 2]

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Summary.—Success in rugby union competition is dependent partly on the defensive strategies of a team. Despite this, little empirical evidence exists about effective defensive strategies used during play. This study attempted to identify defensive characteristics associated with increased likelihood of a successful outcome in rugby union, while considering the game situation. Twenty-one matches of the 2010 Super 14 competition were analysed, amounting to 2,394 coded tackle contacts. The likelihood of the defending team winning the breakdown (the post-tackle contact situation where opposing teams compete for possession of the ball) increased as the match progressed. Defensive speed, measured as the speed of the defence in response to the attacking line, was a statistically significant predictor of breakdown wins and preventing the attacking team from advancing towards the gain line. Identifying the relative effectiveness of such strategies allows understanding of rugby match behaviour and may be applied to improve organisation, design, training, teaching and learning the game.

From the onset of professionalism, rugby union has evolved into a more structured sport, with teams demonstrating increasingly complex match strategies and tactics. Comparable to most team sports, the objective of match strategy and tactics when attacking is to gain territory, progress towards the opponent's goal line, and ultimately to score points. Teams also employ strategies and tactics to prevent the attacking team from gaining territory and progressing towards the goal line; this is referred to as defence. Another purpose of defence is to regain possession of the ball (Gréhaigne, Richard, & Richard, 2005; Westgate, 2007). Approximately 50% of the game is spent defending (International Rugby Board Game Analysis, 2011a, 2011b, 2011c); therefore, success in rugby union is typically dependent, in part, on the defensive strategies of a team.

Defensive strategies are structured in response to the playing situation, the position and spacing between players within the structure, the

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line speed and movement, and the communication and interaction between players (Westgate, 2007). This structured movement of players with a common goal in a match setting is analogous to a dynamic system (McGarry, Anderson, Wallace, Hughes, & Franks, 2002; Passos, Araujo, Davids, & Shuttleworth, 2008; Passos, Milho, Fonseca, Borges, Araujo, & Davids, 2011; Hendricks, Karpul, & Lambert, 2012) and typically consists of either one or two movements to form the shape of the defence. For instance, the initial movement could be a straight line towards the attack, followed by a side movement towards the touch line (up and out) depending where the ball is played. The movement of players within the defensive line is regulated by a number of constraints: for example, the rules of the game, the attacking strategy of the team in possession of the ball, the behaviour of players within the defensive system, perceptions of the situation, and instructions given by the coach during training or before the game (McGarry, *et al.*, 2002; Passos, *et al.*, 2008; Passos, *et al.*, 2011). An effective and efficient system should have the capacity to restructure and reorganise the defensive strategy successfully in response to these constraints (McGarry, *et al.*, 2002; Passos, *et al.*, 2008; Passos, *et al.*, 2011). Arguably, therefore, defence in rugby union cannot be comprehensively studied unless characteristics of the playing situation are taken into account. Studying defence and its playing situation is important for coaches, physical educators and sports scientists who wish to replicate the match environment adequately during training. Re-creation of match situations during training affords the player the learning and performance environment in which the appropriate task constraints and perceptual cues are represented and available for exploration (Pinder, Davids, Renshaw, & Araujo, 2011).

To optimize training and preparation for matches and thereby improve performance, researchers and coaches frequently study performance characteristics of successful teams and analyse strategies and tactics of opposition teams (Ortega, Villarejo, & Palao, 2009; Glazier, 2010; Gomez, Lorenzo, Ibanez, Ortega, Leite, & Sampaio, 2010; Wheeler, Askew, & Sayers, 2010; Vilar, Araujo, Davids, & Button, 2012; Gomez, Lorenzo, Ibanez, & Sampaio, 2013). An effective method for studying and analysing team performance has been the use of video and notational analysis (Hughes & Bartlett, 2002; Jones, James, & Mellalieu, 2008; Vaz, Van Rooyen, & Sampaio, 2010). A fundamental component of notational analysis is the selection and identification of key action variables of the sport that define some or all aspects of performance (Hughes & Bartlett, 2002). To be effective, key action variables are usually identified and selected based on their association with a successful performance or outcome. In rugby union, video and notational analysis have been used extensively from identifying injury mechanisms and risk factors (Quarrie & Hopkins, 2008; Fuller, Ashton, Brooks, Cancea, Hall, & Kemp, 2010; McIntosh, Savage, McCrory, Frechede, & Wolfe, 2010; Longo, Huijsmans,

Maffulli, Denaro, & De Beer, 2011), to quantifying match demands (Duthie, Pyne, & Hooper, 2005; Deutsch, Kearney, & Rehrer, 2007; Roberts, Trewartha, Higgitt, El-Abd, & Stokes, 2008; Austin, Gabbett, & Jenkins, 2011a, 2011b) and their relationship with biological markers of muscle damage such as creatinine kinase (Takarada, 2003). In particular, video and notational analysis has been used to describe attacking strategies associated with team performance (Wheeler, *et al.,* 2010). Wheeler, *et al.* (2010) described attacking patterns of teams during the 2006 Super 14 and their association with successful phase outcomes and team success. A major finding of this study was that tackle-breaks (where the attacker penetrates the attempted tackle and continues to advance) and not line-breaks (attacker evades contact, breaches the defensive line, and continues to advance) or offloading (attacker is able to pass the ball to a team-mate after contact to continue attack) were associated with team success in rugby union (Wheeler, *et al*., 2010). The authors proposed that this finding suggests that defensive structures at the elite level may limit the space of attackers, and therefore prevent attackers from breaking the line. In spite of this proposal, this finding was difficult to substantiate since the study did not describe defensive strategies in detail. Overall, studies on defensive strategies in rugby union are limited.

Analysis of effective attacking strategies is potentially helpful for designing training drills and game strategies to prepare adequately for competition (Wheeler & Sayers, 2010, 2011). On the other hand, there is not enough empirical evidence available for training effective defensive strategies. For analysis of defensive strategies to prove meaningful, characteristics of the playing situation should be considered (Gomez, *et al*., 2013). Therefore, the purpose of this study is to describe the playing situation and defensive characteristics that would increase the likelihood of a successful phase outcome in rugby union.

Method

Procedure

Twenty-one matches were analysed of the 2010 Super 14 competition, which comprised 2,394 coded tackle contact events, an average of 114 (SD = 20) tackle contact events per match. Each game was randomly selected; however, quota sampling was used to ensure relatively equal distribution between playing teams and competition week. This was to avoid a bias towards a specific team or time during the competition. The average number of tackle contact events per competition week was 171 (SD = 55) and per team was 160 (SD = 72). Video footage was obtained from recorded matches available from the public broadcasters.

Video footage of matches were analysed using Sports Code Elite Version 6.5.1, using an Apple iMac (Apple, USA). The monitor screen

of the Apple iMac (Apple, USA) was positioned at eye level. The analysis software allowed control over the time lapse during each movement and the recording and saving of each coded event into a database. The highest frequency at which the analyst could slow down the motion of the footage was 25 frames per second (Hz). Events were coded using both characteristics and definitions described in previous research and characteristics and definitions developed specifically for this study (Docherty, Wenger, & Neary, 1988; Brooks, Fuller, Kemp, & Reddin, 2005; Deutsch, *et al.,* 2007; Fuller, Molloy, Bagate, Bahr, Brooks, Donson, *et al.,* 2007; Wheeler & Sayers, 2009; Fuller, *et al.,* 2010; Wheeler, *et al.,* 2010). Characteristics were divided into three categories: playing situation, defensive characteristics, and phase outcomes.

Identification and Selection of Variables

A great deal of care and consideration was given to the list of variables and their respective operational definitions. Variables must have validity, that is, represent a relevant and important aspect of the playing situation, defence or performance outcome. Their definitions had to be clear and unambiguous. To ensure the logical and content validity for describing defender actions, the list was more inclusive than exclusive. Variables and operational definitions were strictly based on published peer-reviewed studies in the area. After the list of variables was established, a panel of coaches, sport scientists and rugby administrators were consulted to review the validity and relevance of the variables and the lucidity of the operational definitions.

In line with the purpose of this study, characteristics were divided into three categories: playing situation, defensive characteristics, and phase outcomes (Tables 1, 2, and 3). The playing situation category described factors that may influence the defensive strategy of a team. The defensive characteristics described the defensive strategy of a team. Phase outcomes were described to relate the playing situation and defensive characteristics to a performance outcome. Variables for each of these categories were selected, guided primarily by relevant characteristics and definitions described in the scientific literature analysing rugby performance; for example, pass number and attacking strategy (Docherty, *et al.,* 1988; Deutsch, *et al.,* 2007; Wheeler & Sayers, 2009; Fuller, *et al.,* 2010; Wheeler, *et al.,* 2010). If no scientific literature was available, coaching literature on defence was used (Westgate, 2007) to develop variables and definitions specific for this study. For example, in Wheeler, *et al.* (2010), 'attacking depth' was defined as the distance from the ball-carrier in the attacking line to the defence when receiving possession of the ball, and was described as either close, moderate or distant. For the present study, a similar characteristic was defined as the distance of defence in relation to the attacker when the attacker received possession of the ball ('distance of defence'), with 'close,' 'moderate,' or 'distant.'

TABLE 1
PLAYING SITUATION, OPERATIONAL VARIABLES, AND THEIR CORRESPONDING DESCRIPTOR VARIABLES

Playing Situation Operational Variable	Description
Previous phase or set piece	The phase or set piece preceding the attack/defence interaction. These were divided into scrums, lineouts, ruck and mauls (as defined by the International Rugby Board).
Pass Number: the number of passes from the previous phase or set piece where the attacker received the ball and makes contact with the defender (Wheeler, *et al.*, 2010).	
Immediate	Attacker receives possession of the ball directly from the breakdown, or set piece (i.e., no pass).
Close	Attacker receives possession of the ball through no more than one pass from the breakdown or set piece.
Middle	Attacker receives possession of the ball through a pass from the first receiver, i.e., second pass.
Wide	Attacker receives possession of the ball beyond the second pass.
Attacking Strategy: running lines and direction of the attacker or attacking line (Wheeler, *et al.*, 2010)	
Direct	Attacker ran directly at defenders.
Lateral	Attacker ran away from defenders, i.e., not direct.
Evasive Step	Attacker used a side step or crossover step before contact (period between the attacker receiving the ball, and making contact with the tackler) with the defender.
Combinations of the above	Direct Lateral Evasive Step, Direct Evasive Step, Direct Lateral, Lateral Evasive Step.
Field position	The field was divided into a 4x4 matrix (16 segments). The direction of play was from right to left, i.e., the attackers' goal line was in the A region while the defenders' goal line was in the D region (Fig. 1).
Match period	Each match was divided into four periods of 20 minutes (1st, 2nd, 3rd and 4th period) (Brooks, Fuller, Kemp, & Reddin, 2005; Fuller, *et al.*, 2007).

Coding of Variables

Only one analyst coded videos. The analyst/researcher studied the variables and their corresponding definitions to make certain each variable was understood. When the analyst/researcher observed behaviours

TABLE 2
DEFENSIVE CHARACTERISTICS, OPERATIONAL VARIABLES, AND THEIR CORRESPONDING DESCRIPTOR VARIABLES

Defensive Characteristic Operational Variable	Description
Distance of Defence: distance of the defence in relation to the attacker when the attacker receives possession of the ball (Wheeler, *et al.*, 2010).	
Close	Attacker receives ball within one body length of defence.
Moderate	Attacker receives ball one to two body lengths from defence.
Distant	Attacker receives ball more than two body lengths from defence.
Defensive Speed: the speed of the defence in response to the attacking line (Docherty, Wenger, & Neary, 1988; Deutsch, *et al.*, 2007).	
Slow	Defence is stationary or walking (No locomotor movement). Slow forwards, backwards or sideward movement. One foot in contact with ground at all times and no arm drive.
Moderate	Defence is jogging or a slow run with low knee lifts and little arm drive.
Fast	Defence is running with high knees and rapid arm movement or sprinting at ball reception.
Defensive Direction: the direction of movement of the defence in response to the attacking line.	
Lateral	Defence is approaching the ball carrier laterally.
Backwards	Defence is retreating from the ball carrier.
Forwards	Defence is approaching the ball carrier front-on.
No direction	Defence has no identifiable movement direction, i.e., not moving lateral, backwards or forwards.
Defensive Shape and Movement: configuration and movement pattern of defenders.	
Up and In	Defenders approach the attacking line in a straight line formation followed by the outer players (players furthest away from the ball) advancing ahead of the line towards the ball.
Up and Out	Defenders approach the attacking line in a straight line formation followed by inner players (players closest to the ball) following the movement of the ball towards the touch line.
Push/Rush	The defenders approach the attacking line at a fast speed and are in a straight and direct line.

(continued on next page)

TABLE 2 (CONT'D)
DEFENSIVE CHARACTERISTICS, OPERATIONAL VARIABLES, AND THEIR CORRESPONDING DESCRIPTOR VARIABLES

Defensive Characteristic Operational Variable	Description
Lateral Shift	Initial movement of the defenders is towards the touch line without challenging attacking line/attacker.
Advancing Runner	One defender shoots rapidly from the defensive line ahead of the other defenders towards attacking line/attacker.
Straight Line	Defenders are in a straight line while approaching the attacking line.
Static Line	Defenders are in a straight line with no movement toward the attacking line/attacker.
Arrow Head	Defenders approach the attacking line in a triangle shape formation, i.e., one defender is followed by other defenders besides and behind him on each side.
Random	Defenders with no clear configuration or movement pattern.
Side	Tackler moving in from the ball-carrier's side.
Oblique	Tackler moving into ball-carrier at an angle.
Behind	Tackler chasing ball-carrier towards own try-line.
Defender vs. Attacker Ratio: the ratio of the number of attackers vs. the number of defenders of the defence line from when the phase begins.	
Man on man	Same number of defenders and attackers.
One man overlap	One more defender in the defensive line compared to the attacking line.
Two man overlap	Two more defenders in the defensive line compared to the attacking line.
Multiple overlap	More than two defenders in the defensive line compared to the attacking line.
One man underlap	One more attacker in the attacking line compared to the defending line.
Two man underlap	Two more attackers in the attacking line compared to the defending line.
Multiple underlap	More than two attackers in the attacking line compared to the defending line.

that fulfilled the definitions (for example, 'direct': attackers ran directly at defenders), the event was coded. Despite using only one coder, and all the efforts made to increase the objectivity of the methods, some subjectivity is expected with a human observer (O'Donoghue, 2010).

TABLE 3
PHASE OUTCOMES, OPERATIONAL VARIABLES, AND THEIR CORRESPONDING DESCRIPTOR VARIABLES

Phase Outcome Operational Variable	Description
Gain line: an imaginary line that is drawn through the middle of the set piece/breakdown width wise dividing the field into two separate regions (Westgate, 2007). Advancing beyond this line is seen as progress towards the opposition goal line.	
Gain line not crossed	The defensive team prevented the attacking team from crossing the gain line.
Gain line crossed	The defending team was unsuccessful in preventing the attacking team from crossing the gain line. The gain line was crossed either by a tackle break, offload, line break or tackled after crossing the gain line (Wheeler & Sayers, 2009; Wheeler, *et al*., 2010).
Tackle Break	Gain line crossed by attacker penetrating the attempted tackle.
Offload	Gain line crossed by attacker successfully off loading in the contact situation.
Line Break	Gain line crossed by attacker successfully evading contact.
Tackled	Tackled after crossing the gain line.
Breakdown: post-tackle contact situation where opposing teams compete for possession of the ball, usually a ruck or maul.	
Breakdown Win	Defending team successfully regained possession of the ball.
Breakdown Loss	Defending team failed to regain possession of the ball.
Breakdown penalized	An offense, which is caused by a player during the breakdown.
The Tackle Sequence: the sequence of attacker and defenders in the contact situation (Fuller, *et al*., 2010).	
One-on-one	One defender contacts one attacker.
Sequential	One defender contacts one attacker, followed by a second defender joining the contact situation.
Simultaneous	Two defenders contact one attacker at the same time.
Attacking sequential	Two attackers contact one defender after each other.

The defending team was identified as the team without possession of the ball, with two or more players (defenders) facing the attacking line at the phase of play or at the point of breakdown (the moment or period immediately after a tackle has been completed, and opposing teams com-

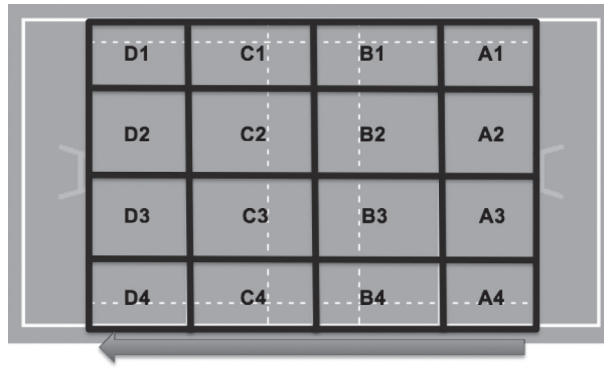

FIG. 1. Field position was divided into a 4 × 4 matrix (16 segments). The direction of play was from right to left, i.e., the attackers' goal line was in the A region while the defenders' goal line was in the D region.

pete for possession of the ball, usually in a ruck or maul). An attacking line was identified when the ball-carrier (attacker in possession of the ball) and potential ball-carriers (support players) challenged the gain line, which is an imaginary line drawn across the centre of the field between the attacking and defending teams when there is a breakdown or set piece (scrums and lineouts, as defined by the International Rugby Board). Advancing beyond the gain line represents a gain in territory and progress towards the goal line (Sayers & Washington-King, 2005). Coding of the defence started once the ball was played from the set piece or breakdown. Field position was divided into a 4 × 4 matrix (16 segments). The direction of play was from right to left, i.e., the attackers' goal line was in the A region while the defenders' goal line was in the D region (Fig. 1).

Only events with clearly identified breakdown/set piece and attack/defender lines were used. Kick and advantage plays (the period after penalty or free-kick infringement, where play is allowed to continue provided an opportunity to gain territory or score points is achievable for the non-infringing side) were excluded from the analysis. Advantage plays were excluded since the outcomes of these events after the advantage is awarded is predetermined and independent of the defensive strategy of the team.

Reliability

For intra-coder reliability, two different matches were each coded twice using the variables and definitions described previously. Coding of the same match was separated by at least one week (Wheeler, *et al.*, 2010). Kappa statistics (κ) were used to test the intra-reliability of the coder for

each of the two matches. For match 1, overall $\kappa = .86$, playing situation $\kappa = .86$, defensive characteristics $\kappa = .77$, and outcomes $\kappa = .91$. For match 2, overall $\kappa = .80$, playing situation $\kappa = .77$, defensive characteristics $\kappa = .78$, and outcomes $\kappa = .87$. Kappa values between .81 and .99 represent excellent agreement between repeated measures, and values between .61 and .80 represent "substantial agreement" (O'Donoghue, 2010).

Statistical Analyses

The analysis assessed which defensive characteristics increased the likelihood of a successful phase outcome, taking into account the playing situation. Multinomial and binomial logistic regression (Logit) analysis was computed using STATA 11.1 (StataCorp LP, USA). Logistic regression was appropriate for four main reasons: (1) Logit computes the relationship among variables, with one variable being the dependent (i.e., outcome) variable, whereas the other variables are the independent predictor or explanatory variables; (2) the independent variables can be categorical with no natural order; (3) it allows for more than 2 (multiple) independent variables; (4) tests of significance can be targeted either at each individual independent variable or at the combined effectiveness of the full set of independent variables (Huck, 2012). Similar analyses of performance can be found in volleyball (Marcelino, Mesquita, & Sampaio, 2011), basketball (Gomez, *et al*., 2013), and tennis (Ma, Liu, Tan, & Ma, 2013). Before the Logit analysis, descriptive statistics (frequency %) were calculated. Characteristics that had a percentage frequency of 0% were excluded from Logit analysis. Main effect Logit models with the appropriate independent variables were conducted for each phase outcome (first stage model). Thereafter, likelihood ratio tests were conducted to test the overall effect of each independent variable on the first stage model. Independent variables that had an overall statistically significant effect on the first stage model were subsequently identified. An adjusted second stage model was then computed with the significant variables expanded upon and reported (specific effects model). Relative risk ratios (RRR) and 95% confidence intervals were reported for the main effects models and the characteristics of the specific effects model. Significant characteristics in the specific effects model were also disclosed, with alpha set at $p < .05$. The relative risk ratio is a ratio of the probability of the event (outcome) occurring in the observed characteristic versus the non-observed characteristic. To perform this analysis, predictor variables are computed relative to a reference or base variable. For this study, the base variables were: Period: 1st quarter; Pass number: close; Attacking strategy: direct; Defensive speed: slow; and Defensive direction: no direction. For the outcomes of this study, com-

parison outcomes were related to the following base outcomes: Breakdown: lost; Tackled: gain line not crossed.

No specific selection process was used to decide the base descriptors and outcomes. It should be kept in mind that the specification of a particular base descriptor or outcome has no bearing on the results. The standard interpretation of the multinomial logistic regression is that for a unit change in the predictor variable; the logistic of comparison outcome relative to the base outcome is expected to change by its respective parameter estimate (RRR), given that the characteristics in the model are held constant (University of California & Institute for Digital Research and Education, 2012a, 2012b). An alternative way to interpret multinomial logistic regression analysis is, if the RRR of the predictor variable is more than 1, the comparison outcome is more likely to occur, and if the RRR of the predictor variable is less than 1, the base outcome is more likely to occur (University of California & Institute for Digital Research and Education, 2012b). The likelihood is represented by the RRR value.

Phase Outcomes and Points Scored Against

The purpose of this analysis section was to show the relationship between the outcomes of this study and the results of the match, which is the ultimate measure of team performance. Because we were interested in studying defensive strategies, we thought points scored against (as opposed to winning or losing) would be a more representative measurement proxy for defence. To compare the phase outcomes of the defensive strategy to the points scored against a team, without complicating matters, chi-squared (χ^2) was used. Given that chi-squared analysis commonly associates categorical variables and points against a team are numerical, it was decided to categorise 'points scored against' into 5 categories. The justification for this is that winning/losing a match within 3, 5, or 7 points still seems like a close match. In contrast, regardless of the difference, e.g., in 45 points against or 65 points against, coaches, players and spectators would perceive this as a one-sided match. In view of this reasoning, it was decided to categorise points scored against into intervals of 10 points up to 40 points. Anything higher than 40 points was placed into >40 points category: Strong defence, 0–10 points; Good, 11–20 points; Satisfactory, 21–30 points; Poor, 31–40 points; Weak, >40 points.

Results

Table 4 reports the frequency percentages for playing situation characteristics. Table 5 reports the frequency percentages for defensive characteristics. Table 6 reports the frequency percentages for the phase outcomes.

TABLE 4

FREQUENCY PERCENTAGES FOR PLAYING SITUATION CHARACTERISTICS. DATA REPORTED AS FREQUENCY (*N*) AND PERCENTAGES (%) (*N* = 2,394) BY OPERATIONAL VARIABLE (SET PIECE, PASS NUMBER, ATTACKING STRATEGY, MATCH PERIOD)

Playing Situation											
Set Piece			Pass Number			Attacking Strategy			Match Period		
Descriptor Variable	*n*	%	Descriptor Variable	*n*	%	Descriptor Variable	*n*	%	Descriptor Variable	*n*	%
Breakdown	2,017	84	Immediate	497	21	Direct	1,483	63	1st Quarter	488	22
Lineout	26	1	Close	983	41	Direct Evasive Step	187	8	2nd Quarter	502	23
Scrum	199	8	Middle	627	26	Direct Lateral	6	0	3rd Quarter	594	27
Maul	152	6	Wide	284	12	Direct Lateral Evasive	10	0	4th Quarter	608	28
						Lateral	455	19			
						Lateral Evasive Step	212	9			
						Evasive Step	3	0			

TABLE 5

FREQUENCY PERCENTAGES FOR DEFENSIVE CHARACTERISTICS. DATA REPORTED AS FREQUENCY (*N*) AND PERCENTAGES (%) (*N* = 2,394) BY OPERATIONAL VARIABLE (DEFENSIVE DISTANCE, DEFENSIVE SPEED, DEFENSIVE DIRECTION, DEFENSIVE SHAPE, AND MOVEMENT)

Defensive Characteristic											
Defensive Distance			Defensive Speed			Defensive Direction			Defensive Shape and Movement		
Descriptor Variable	*n*	%	Descriptor Variable	*n*	%	Descriptor Variable	*n*	%	Descriptor Variable	*n*	%
Close	1,308	55	Slow	903	38	Forwards	1,288	54	Straight Line	806	34
Moderate	562	24	Moderate	1,326	56	Lateral	512	21	Static Line	308	13
Deep	520	22	Fast	153	6	Forward Lateral	131	5	Advancing Runner	232	10
						No direction	450	19	Up and Out	161	7
						Backwards	4	0	Up and In	233	10
									Lateral	299	12
									Random	218	9
									Rush/Push	32	1
									Arrow Head	104	4

TABLE 6

FREQUENCY PERCENTAGES FOR PHASE OUTCOMES. DATA REPORTED AS FREQUENCY (*N*) AND PERCENTAGES (%) (*N* = 2,394) BY OPERATIONAL VARIABLE (GAIN LINE, BREAKDOWN, OTHER OUTCOMES, AND TACKLE SEQUENCE)

Phase Outcome											
Gain Line			Breakdown			Other Outcomes			Tackle Sequence		
Descriptor Variable	*n*	%	Descriptor Variable	*n*	%	Descriptor Variable	*n*	%	Descriptor Variable	*n*	%
Not crossed	1,008	43	Breakdown Win	329	14	Handling error	176	46	One on one	832	37
Tackled but crossed	1,007	43	Breakdown Win (pen)	55	2	Knock on	137	36	Sequential	802	36
Tackle Break	196	8	Breakdown Loss	1,860	78	Forward pass	19	5	Simultaneous	464	21
Line Break	54	2	Breakdown Loss (pen)	147	6	Handling error (touch)	7	2	Attacking sequential	152	7
Offload	93	4				Interception	9	2			
						Touch	30	8			
						Obstruction	2	1			

Phase Outcome and Match Results

Winning in the 2010 Super 14 was associated with a team's breakdown win/loss ratio when defending [$\chi^2(1)=5.10$, $p=.05$, $\varphi_c=0.05$]. Winning teams won more breakdowns (17%) on defence (regaining possession of the ball) compared to losing teams (13%). Teams that won more breakdowns also had fewer points scored against them (18% breakdown wins when coded as having Strong defence compared to 15% breakdown wins when having Weak defence. Crossing the gain line was not statistically significantly associated with winning or losing [χ^2 (4) = 4.11, p = .39, φ_c = 0.04]. However, crossing the gain line was associated with the number of points scored against a team [χ^2 (16) = 38.73, p = .001, φ_c = 0.07]. Teams coded as having a Strong defence had fewer line breaks (1%) and tackle breaks (8%) compared to teams in the other points against categories.

Playing Situation, Defensive Characteristics, and Breakdown Outcome

The probability of the defensive side winning the breakdown and regaining possession of the ball increased as the match progressed (RRR = 1.45, 95%CI = 1.01, 2.09, p = .04 in the 4th quarter) (Fig. 2). Also, the defensive team's chances of winning the breakdown significantly increased

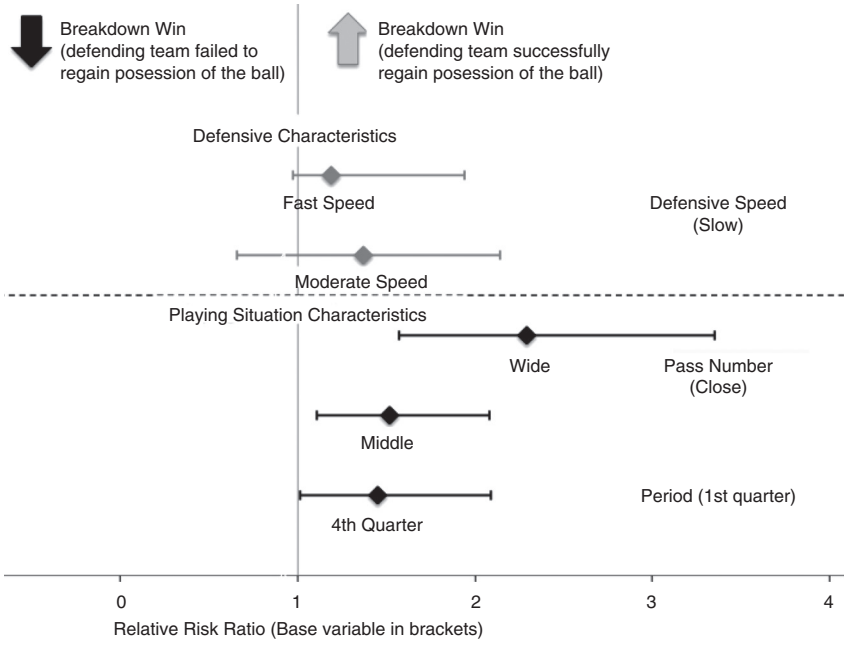

FIG. 2. Summary binomial logistic regression for breakdown success. Data reported as relative risk ratios (RRR) and 95% confidence intervals (95%CI). Base variable in brackets.

when the attacking team played the ball further away from the previous phase or set piece (Immediate: RRR=0.74, 95% CI=0.48, 1.13; Middle RRR=1.52, 95%CI=1.11, 2.08, $p=.01$; Wide RRR=2.29, 95%CI=1.57, 3.35, $p < .001$). The likelihood of a breakdown win increased with Moderate defensive speed (RRR=1.37, 95%CI=0.66, 2.14) compared to Slow speed, provided all the other characteristics in the model remained constant.

Playing Situation, Defensive Characteristics, and Crossing the Gain Line

Playing the ball Wide significantly reduced the probability of the defending team stopping a line break (Line-Break RRR=4.77, 95%CI=1.97, 11.55, $p=.001$) or preventing an offload (Offload RRR=2.97, 95%CI=1.42, 6.22, $p=.004$) (Fig. 3). Whether running directly or laterally, the addition of an evasive manoeuvre by the attack before contact significantly decreased the chances of the defence preventing an offload (Offload Lateral Evasive Manoeuvre RRR=2.09, 95%CI=1.06, 4.10, $p=.03$) or completing a tackle (Tackle Break Direct Evasive Manoeuvre RRR=2.73, 95%CI=1.64, 4.55, $p < .001$; Lateral Evasive Manoeuvre RRR=2.63, 95%CI=1.59, 4.34, $p<.001$). A moderate (Tackled-Gain line crossed RRR=0.44, 95%CI=0.34, 0.57, $p<.001$) or fast (Tackled-Gain line crossed RRR=0.42, 95%CI=0.27, 0.67, $p<.001$) defensive line speed significantly reduced the likelihood of the attacking team crossing the gain line. The probability of defenders stopping the attackers from penetrating the tackle (Tackle Break RRR=2.19, 95%CI=1.11, 4.34, $p=.02$), and preventing the attackers from crossing the gain line (Tackled-Gain line crossed RRR=1.58, 95%CI=1.06, 2.36, $p=.02$), was significantly reduced when the defenders approached the attacker from a lateral direction. In contrast, approaching attackers from a front-on direction significantly improved defenders' chances of stopping the attack from crossing the gain line (Tackled-Gain line crossed RRR=0.37, 95%CI=0.27, 0.50, $p < .001$).

Having an Advancing Runner (defender shoots rapidly from the defensive line) or no clear defensive shape or movement significantly decreased the likelihood of a double tackle (RRR=0.19, 95%CI=0.78, 0.47, $p < .001$; Random RRR=0.37, 95%CI=0.19, 0.74, $p=.005$). For the variable defender vs attacker ratio (ratio of the attacker's vs. the number of defenders of the defence line from when the phase begins), only 240 of the possible 2,394 total events coded as high and wide screenshots were necessary to count all attackers and defenders. The defensive speed [$\chi^2(8)=15.62$, $p=.048$, $\phi_c=0.18$), and defensive shape and movement [$\chi^2(32)=59.83$, $p=.002$] of the defending team were significantly associated with the defender vs. attacker ratio. During a phase play where attackers had an extra player, the defensive shape and movement used most frequently by defenders were Up and Out (27%), and

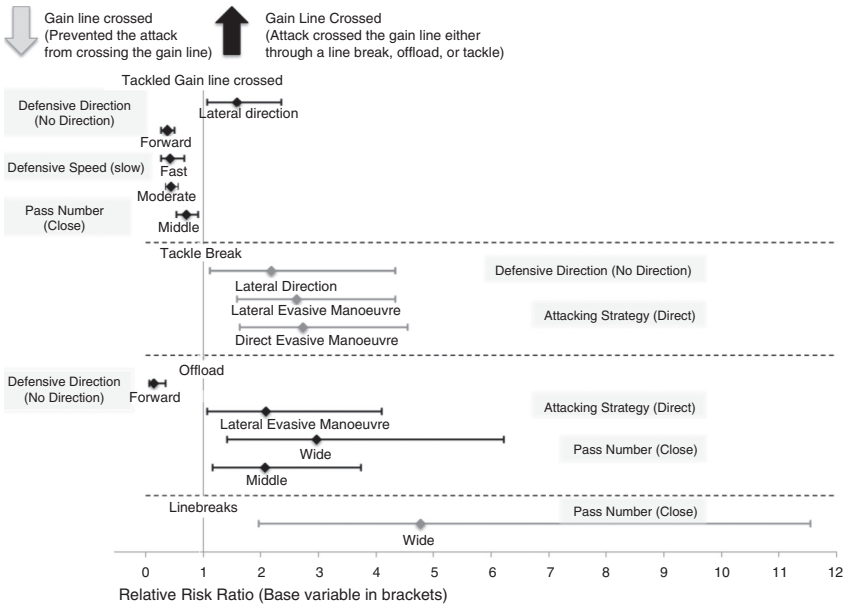

FIG. 3. Summary multinomial logistic regression for crossing the gain line. Data reported as relative risk ratios (RRR) and 95% confidence intervals (95%CI). Base variable in brackets.

Lateral Shift (30%). A Moderate defensive speed (77%) was used most frequently when the attacking side had an extra player during a phase play.

DISCUSSION

This study described the playing situation and defensive characteristics that increased the likelihood of the defending team winning the breakdown or preventing the attacking team from crossing the gain line. The likelihood of the defending team winning the breakdown increased as the match progressed, and when the attacking team moved the ball further away from the previous phase or set piece. Moreover, defensive speed was the only defensive characteristic that predicted breakdown wins, where defenders approaching attackers at a moderate or fast speed increased the probability of a breakdown win. Approaching the attacking line at a set speed affords less time and space for the attackers to select and execute their play (Gabbett & Kelly, 2007; Westgate, 2007; Biscombe & Drewett, 2010). Breakdown success out wide may be a result of an attacker being isolated and, as a consequence, not having enough supporting players at the breakdown to maintain possession of the ball.

These findings are in accordance with studies describing effective attacking strategies where attacking wide was associated with losing the breakdown (Wheeler & Sayers, 2009; Wheeler, *et al.*, 2010). The definition of breakdown success used in this study was based on previous research in this area (Jones, *et al.*, 2008; Wheeler, *et al.*, 2010), and was defined according to the defensive teams regaining possession of the ball. The ability to win the breakdown is not only dependent on tactical proficiency as measured in this study, but also technical proficiency (Takarada, 2003; Smart, Hopkins, Quarrie, & Gill, 2011); therefore, tackle and breakdown technique may have influenced the outcome of the event.

In contrast to breakdown wins, passing the ball wide increased the probability of line-breaks and offloads. Considering that attacking wide increases the chances of the defensive side winning the breakdown, but also affords the attacking team a higher probability of line-break and offload, these findings collectively suggest that when contact is avoided out wide defensive lines are vulnerable; as a result, the gain line is crossed. For defenders, preventing line-breaks and offloads is key to success in rugby union, as the present study and Wheeler, *et al.* (2010) have shown a positive association between the number of line-breaks and offloads and the amount of points scored against a team. The addition of an evasive manoeuvre (example, side-stepping, crossover stepping) by the attacker, regardless of the running line, further increased the vulnerability of the defensive line since this increased the attacker's chances to offload or break the tackle. These findings lend support to previous research in this area where an evasive manoeuvre represented the most effective attacking strategy in achieving tackle breaks (Sayers & Washington-King, 2005; Wheeler, *et al.*, 2010). An attacker utilizing an evasive manoeuvre to avoid front-on contact is likely to put the defender in a weak position, resulting in a poor and ineffective attempted tackle; as a consequence, the attacker is able to break the tackle or free his arms to offload the ball.

A moderate or fast defensive line speed reduced attackers' chances of crossing the gain line. This provides further evidence for the effectiveness of line speed during defence in rugby union (Gabbett & Kelly, 2007; Westgate, 2007; Biscombe & Drewett, 2010). In addition, approaching attackers front-on reduced the likelihood of the attackers crossing the gain line. This highlights the importance of the defender getting into an advantageous position in preparation for executing an effective tackle (Hendricks & Lambert, 2010; Hendricks, Jordaan, & Lambert, 2012). In the present study, tackle sequence was also used as an outcome variable. When defenders execute a double tackle or sequential tackle, it usually indicates a good defensive strategy. The frequencies for executing double tackles were predicted by a combination of conditions, i.e., appropriate defensive

strategy (speed, direction, shape) for the playing situation, and no single factor alone predicted an execution of a double tackle.

Having an Advancing Runner or no clear defensive shape was most weakly associated with double tackles. The defenders vs. attackers ratio was critical when deciding on which defensive strategy to employ since it is reliant on game situation (McGarry, *et al.,* 2002; Westgate, 2007; Passos, *et al.,* 2008; Passos, *et al.,* 2011). To analyse the defenders vs. attackers ratio accurately, wide screenshots are needed to identify all the players in the defensive and attacking lines. Since the study only used commercially available video footage, the analysis was limited to 240 events where these criteria were fulfilled. During a phase play, when the attacking side had one extra player, the strategy applied was Up and Out or Lateral shift with a Moderate defensive speed. These defensive characteristics are synonymous when the defending side is at a number disadvantage, as defenders will try to limit the attacking side space by ushering the attackers towards the touchline (Westgate, 2007; Biscombe & Drewett, 2010). Further analysis, with more events and accounting for the playing situation, is needed to make any additional conclusive remarks.

In association football, proximity-to-goal has been shown to influence the play strategy of the attacker and defender (Headrick, Davids, Renshaw, Araujo, Passos, & Fernandes, 2012). The authors of this study concluded that field location, specifically proximity-to-goal, could be considered a primary task constraint that should form part of designing training drills (Headrick, *et al.,* 2012). In the present study, field position was not a statistically significant predictor of breakdown success or crossing the gain line. In contrast to the study in association football, which had a football field divided into three segments, the field position for this study was divided into 16 segments to specify the exact area of the field that increased the probability of the defending team winning the phase outcome. This division may have weakened the statistical power of the variable 'field position' as the frequency in each segment was too low for the logistic regression analysis. To counter this, future studies analysing team strategy might divide the field into four segments across the width of the field from goal line to goal line.

It is worth noting that tactical proficiency alone is not enough to succeed in the techniques represented by the selected outcome variables. Using this study as a basis, it is recommended that future research in this area analyse the relationship between the playing situation, the defensive characteristics of a team, and characteristics of the defenders' tackling technique. Furthermore, future research should investigate how this relationship influences the chances of the defending team winning the breakdown and gaining possession of the ball or prevents the attacking team from

crossing the gain line. Prospective studies should also account for factors such as match location (i.e., playing at home or away), quality of opposition, and match status, as studies in other team sports have shown that these factors can influence a team's strategy and tactics (Taylor, Mellalieu, James, & Shearer, 2008; Lago, 2009; Gomez, *et al.*, 2010; Marcelino, *et al.*, 2011). An obvious application is that defensive training drills should represent match conditions to improve defenders' adaptability to the playing situations. From a practical perspective, the defensive strategies executed during matches should be governed by the playing situation. For this reason, defensive training drills should simulate match conditions to improve defenders' adaptability to the playing situation.

In conclusion, the period of the match, the distance of the contact event in relation to the previous phase, and the line-speed of the defence were identified as key variables that predict the likelihood of a successful phase outcome. Although more work may be needed to understand the relations between technical and tactical aspects of defence, incorporation of these key variables into training are recommended. For example, coaches may want to spend more time during training working on the line speed of defenders, or train defence under different fatigue conditions (to characterise match period).

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