KNOWLEDGE, ATTITUDES AND BEHAVIOURS OF TOP-LEVEL JUNIOR (Under-19) RUGBY UNION COACHES TOWARDS TRAINING THE TACKLE

By

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Declaration

I, Martin Sarembock, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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(Date)

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- In loving memory of Zulik ^_^

"Fairy tales are more than true, not because they teach us that dragons exist; but because they teach us that dragons can be beaten" - G K Chesterton

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Glossary of Terms (used in the context of this study)

Attitude	A way of thinking or feeling, that is reflected by behaviour
Behaviour	An action or reaction to something
Ball-carrier	The attacking player who has possession of the ball
Injury Risk	The likelihood that harm will occur when exposed to, or engaged in, a particular activity
Knowledge	Information and skills acquired through experience or education
Line out	The way the game is re-started after the ball goes out. The forwards of each team go into a single file formation and compete for the ball, which is thrown between the lines.
Maul	A loose scrum formed by a player who has possession of the ball, and is still on his feet.
Passing	Technique used to give the ball to a teammate. The ball has to travel backwards for a legal pass to take place.
Ruck/Breakdown	After the tackle, players contest for the ball over the grounded player(s)
Rugby Union	A full contact team sport, played with 15 players on each team, on a grass field,

	with an oval ball. Points are scored with a try (5 points), penalty (3 points), drop kick (3 points), and conversion (2 points).
Safety	Lowering the risk of injury
Scrum	Contact phase of play in rugby union where the forwards go into a set formation by interlocking arms and pushing against the opposition.
Sport	An activity involving physical activity and skill individually or in a team. It is generally played against another person or others.
Tackle	A tackle is characterised by a ball-carrier contacting an opposing player(s), known as the tackler. During a tackle, the tackler physically impedes the attacking ball-carrier to prevent progress towards the try-line, and tries to regain ball possession. The ability to repeatedly execute the proper contact skills required to engage in the tackle contest, as a ball-carrier or tackler(s), is associated with both tackle and team performance, and may reduce the risk of injury in contact.

Abstract

Background: The tackle in rugby union is a dynamic and high impact contact situation that occurs frequently during matches and exposes players to high risk of injury and muscle damage. The inability to tackle will result in opposition players gaining territory and possibly scoring points. Indeed, the ability to effectively engage in tackle contact has been associated with team success. While the risk of injury may always be present during these physical contests between the ball-carrier and tackler, coaching of proper techniques and skills may reduce the risk of injury, and at the same time improve performance. With that said, little is known about the knowledge, attitudes and behaviours of rugby union coaches towards coaching the tackle. Therefore the aim of this study was to assess coaches' knowledge, attitudes and behaviours towards coaching the tackle.

Methods: The top 8 rugby-playing schools (Premier A Division) in the Western Province Rugby Union participated in the study (representing 100% of the entire population of top-level junior schools in the region). A questionnaire was used to assess coaches' knowledge, attitude and reported behaviour. Tackle training behaviour was also observed over a period of 4 weeks at the start of the season.

Results: Sixty-two percent of coaches rated proper tackle technique to reduce the risk of injury as *very important* and 75% of coaches rated proper tackle technique as *very important* for improving performance. The tackle was practiced in 16% (n=15) of the total practice sessions (n=96). Coaches did not emphasise safety during the tackle sessions. Tackle training was over-reported by 75% (n=5) of coaches during the 4-week observational period.

Discussion/Conclusion: Majority of coaches are aware of the high risk of injury associated with the tackle. Most coaches believe that tackle technique can improve tackle performance and safety during the tackle event. Coaches develop new

methods mostly through resources such as coaching colleagues and watching televised and live rugby matches. During the observed training period however, only 15 tackle training sessions were observed. It may be important to identify how much tackle training should occur during the pre-season and competition phase of the season to adequately prepare players for competition without increasing the risk of injury. The latest research on ways to reduce the risk of injury and improve performance in the tackle should also be disseminated through the appropriate channels that coaches are known to use. Tackle training guidelines should be based on scientific evidence, and these guidelines should outline how coaches need to design their training to meet their team requirements. Further research should identify which coaching behaviours can be used to effectively train tackle safety and tackle performance during training sessions.

Keywords: Rugby union, tackling, coaching, injury prevention, attitude, knowledge, behaviour

This thesis has been referenced using the Vancouver Bracket style of referencing.

The pilot study has been previously published:

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Chapter 1
Introduction and Scope of Thesis

Rugby Union (henceforth referred to as rugby) is the 3rd most popular contact sport in the world (1). Rugby is a high impact, full contact sport associated with a high incidence of injury (2,3). Compared to other contact team sports such as ice hockey, American football, Australian rules football and soccer, rugby may have an increased risk of injury to players due to the lack of protective equipment and the high frequency of physical collisions between players (4,5).

In rugby, the most frequent contact between players occurs in the tackle (6,7). A tackle is characterised by a ball-carrier contacting an opposing player(s), known as the tackler. During a tackle, the tackler physically impedes the attacking ball-carrier to prevent progress towards the try-line, and tries to regain ball possession. If the referee regards the tackle to be dangerous or suspects foul play during the tackle event the tackler will be penalized (8). The ability to repeatedly execute the proper contact skills required to engage in the tackle contest, as a ball-carrier or tackler(s), is associated with both tackle and team performance, and may reduce the risk of injury in contact (9–15).

Factors that may modify the injury risk of the tackler or ball-carrier during contact have been identified (16–24). Some of these risk factors include speed of collision, high impact force, direction from which the tackle is entered, body regions contacted by the opponent, or contact with the ground (10,23,25,26). There are other factors that influence the injury before the player is engaged in the tackle. These risk factors can either be intrinsic and extrinsic. Intrinsic risk factors may include: age, body composition, knowledge of technique, implementation of technique, physical and mental capacities, previous injury, attitude and genetics (27–31). Extrinsic risk factors include: coaching, training, behaviour, equipment, and environment (27,28,30–32).

Knowledge, attitude and behaviours of players and coaches have been identified as risk factors for injury in sport and in rugby union (33–35). The relationship between knowledge, attitude and behaviour (KAB pathway) is modelled on the assumption that knowledge will modify attitude and in turn adapt the behaviour of an individual (36). These models have been used effectively in the public health sector (37,38) as well as national injury prevention initiatives (39–43). The injury prevention programs offer coaches educational information on best practice for reducing the risk of injury and managing player injuries. This coaching education may not only change the knowledge, attitudes and behaviours of the coach, but also filter down to players to modify their attitude and behaviour towards safety (39,40,43). With that said, little is known about the knowledge, attitudes and behaviours of the coaches.

Coaches are responsible for player safety during training and matches, and training proper techniques, especially for contact skills, is one way coaches can reduce the risk of injury (10). Incorrect tackle contact technique has been highlighted as a risk factor for injury and reduce the probability of success in contact in schoolboy rugby (15). A study has noted that poor tackle technique results in injury, particularly when the ball-carrier or tackler drops his or her head before contact has occurred (25). This increases the risk of hyperflexion of the cervical spine upon impact (14,15,25). As such, injury prevention programs have focused on proper technique during the tackle event for the tackler and ball-carrier (43). However, there is limited research on rugby coaching of proper techniques, especially for training the tackle.

Given the high risk of injury associated with the tackle, and that effective execution of tackle contact skills are a pre-requisite for successful performance in rugby, it is important to understand the knowledge, attitude and behaviours of coaches regarding the tackle, as well as, methods and behaviours coaches' are implementing during tackle training.

Chapter 2
Literature review- Coaching Methods Used For Training The Tackle In Top-Level Schoolboy Rugby Union Players

2.1 Introduction

Sport participation is important to keep individuals physically active and healthy. Participation in both, recreational and professional sport, has many physiological benefits to the body (44). Sport participation is becoming more important as child and adult obesity, diabetes, high blood pressure and heart disease are increasing (45,46). In view of this, safety in sport and physical activity is paramount for effective participation (47).

Based on the characteristics of the sport, sport participation has an inherent risk of injury (48,49). Team sport which involve contact such as rugby, football, Australian rules football (AFL), ice hockey and American football have a high risk of injury as these sports are characterised by a multitude of bodily collisions during a game (4,21,25,48,50,51). In particular, rugby union has an increased risk of injury owing to the lack of protective equipment and repeated physical contact between opposing players often running at high speeds (4,5).

Rugby is the third most popular contact sport played globally (1). Rugby is characterised by a high frequency physical contacts (23,24,35,52). The most frequently occurring contact event in rugby between opposing players is during the tackle.

Epidemiological studies on rugby injuries show that the incidence of injuries is the highest for the tackle compared to any other facet of play (6,23,53–55). There is potential for these injuries to be severe in nature, resulting in time away from the sport (56). The risk of injury during the tackle however, can be reduced. One way of reducing the risk of injury, without reducing the efficiency of the tackle event, is through the coaching proper contact technique (10,57).

Despite attempts to describe best practice and coaching for tackle technique, little is known about the current training methods used to train the tackle (10). Hendricks and Lambert (2010) suggest that one of the fundamental strategies for coaching safe and effective tackle techniques, knowledge of proper contact techniques is required (10). Indeed, the aim of injury prevention programs aim to educate coaches on safe and effective contact techniques (40,42,58).

The main purpose of this review is to discuss coaching and training of the tackle in rugby union, from both a safety and performance perspective. To do so, the relevant literature on coaching, and the methods used to coach technique and skill will be outlined. Thereafter, risk factors for tackle injury and factors that may improve tackle performance will be discussed.

2.2 Rugby Union

Rugby union is a contact sport played with an oval shaped ball. A game of rugby is played over two 40-minute halves, and includes two teams consisting of 15 individuals. The on-field team is made up of eight forwards and seven backline players (43). The forwards can be sub-divided into props, locks and loose forwards. The backline is made up of inside, midfield and outside backs (23). Teams score points by crossing the opponents' try-line and kicking the ball over the crossbar. Crossing the opponents try-line is achieved by the attacking team keeping possession of the ball and progressing toward the opposition's try line. To stop the attacking

team from progressing, and to regain position of the ball, the defending team typically engage their opponents by tackling (8).

2.3 The Tackle in Rugby

The tackle is a dynamic contest when compared to other phases of play, such as the scrum (59). Players' ability to effectively engage in the tackle contest has been associated, in part, to the outcome of the match (60). The tackle is a physical contest between two players, and the outcome is successful (from a tackler point of view) by preventing the ball-carrier from gaining territory and the ball-carriers team from retaining possession of the ball (10,14,52). According to the IRB: *"A tackle occurs when the ball-carrier is held by one or more opponents and is brought to the ground. A ball-carrier who is not held is not a tackled player and the tackle has not taken place. Opposition players who hold the ball-carrier and bring that player to ground, and who also go to ground, are known as tacklers. Opposition players who hold the ball-carrier and do not go to ground are not tacklers"* (61). In the scientific literature, tackles have been defined by the opponent making contact (hit or holding) with the ball-carrier, irrespective of the ball-carrier making contact with the ground (23). The tackle event has been identified as the most common contact event in a game of rugby (56) and has increased by approximately 50% over the years (16,62). Research on the tackle has reported a range between 192 and 293 tackle events per match (13,23,25,62). The wide range of tackle events per match between the different studies may be due to inconsistencies in the definitions used to record the tackle, and perhaps the different levels of play analysed(13). Within a match, Van Rooyen et al. (2012) noted a 34% variance between tackle events (13).

Tackles may be classified according to the direction from which the ball-carrier is contacted by the tackler (10,15,17,23). Tacklers contacting the ball-carrier on the front are considered "front-on" tackles, tacklers contacting the ball-carrier from the side are considered "side-on" tackles, and contacting the ball-carrier from behind are

considered tackles from "behind". In senior professional rugby, the reported frequency of occurrence for each tackle direction is 206 (± 39) *front on*, 105 (± 20) *side on* and 11 (± 5) *tackles from behind* per match (23). Fuller et al. (2010) reported on the number of tackle events engaged by players of 13 English Premier League rugby clubs over two seasons. Over the two seasons they found that 1128 tackles are front-on, 1858 tackles are side-on and 612 are tackles from behind (25). The differences in frequency may be due to the different playing styles in the northern and southern hemisphere's defensive strategies (13,23). Over two seasons, forwards (3186) engage in more tackles than backline players (2769). Loose forwards (flanks and eighth man) are involved in almost double the amount of tackle events (1497) compared to the front three (props and hooker) and second rowers (locks) who engage in 872 and 817 tackle events respectively (25). Middle backs are involved in the most tackle events (1415) of the backline players. The back three (fullback and wings) are involved in less tackle events (875) and the scrumhalf engages in the least tackle events (479) (25).

Tackles have also been described by the manner in which the tackler makes contact with the ball-carrier namely, *arm tackle* in which the tackler stops the ball-carrier using the upper limbs; *collision tackle* in which the tackler stops the ball-carrier without the use of his arm(s); *smother tackle* in which the tackler uses the chest and wraps both arms around the ball-carrier; *tap-tackle* in which the tackler trips the ball-carrier by tapping either of his lower limbs (below the knee); *situational tackle* in which the tackler assesses the situation and attempts a tackle; and finally *goal-line tackle* in which the tackler tackles to defend the goal line (25,63).

If the tackler contacts the ball-carrier above the shoulders, or fails to use his arms during the tackle, or inverts the ball-carrier contacting the ground head first, the tackle is then deemed illegal and results in conceding a penalty (64). Illegal tackles are considered dangerous, and have been associated with serious head, neck or spinal injury (6,8,43,65). To discourage players from engaging in illegal tackles, tacklers

are often sent off the field of play for a short period or the entire match (depending on severity and intent).

There are 151 (Standard Deviation (SD) ± 29) and 131 (SD ± 2) tackle events over the higher and middle anatomical areas of the tackler's body respectively per match and 30 tackle events over the lower anatomical area (SD ±10 tackles) (23). The ball-carrier is contacted in 37 (SD ± 10) tackle events over the high and 44 (SD ± 9) over the middle anatomical areas. Whereas, the ball-carrier is least contacted over the head/neck (4 ± 2 tackle events) and lower anatomical area (15 ± 5 tackle events) (23). Both tackler and ball-carrier are at increased risk of injury with a high speed going into the contact event, collision type tackle, if the head or neck are struck in the tackle and if there is a high impact force (25).

The frequency of effective tackle events during a rugby match may be associated with a successful outcome for a particular team. In a study reporting on game statistics in Super Twelve Rugby, teams that performed more tackles win close scoring games (60). Although, more recent research in the Six Nations rugby competition showed that winning teams were involved in fewer non-effective tackle events (13). In the same study, winning teams engage in 3% more "effective" tackle events and 4% fewer "less effective" tackle events than losing teams (13). 'Effective' tackles are defined by tackling the ball-carrier in a backward direction relative to the defensive line or the ball-carriers forward momentum is stopped short of the tacklers defensive line whereas, 'less effective' tackles are defined by the ball-carrier making a territorial gain beyond the point of contact or defensive line (13).

2.4 Epidemiology and Risk of Injury in Rugby

In general, the risk of injury in rugby is high relative to other team sports such as Australian rules football and soccer (56). Reported injury rates for professional and amateur rugby players are 91 injuries per 1000 player-match-hours and 15-74

injuries per 1000 player-match hours, respectively (19,53,56). For training, the incidence of injuries was reported as 3.5 injuries per 1000 player-training hours at the professional level (66). Fewer injuries occur during pre-season matches compared to in-season matches (56). During a match, the incidence and severity of injuries are reportedly highest during the final quarter of play for players who started the match (56).

The risk of injury in junior rugby (15,54,67,68) is similar to senior elite rugby union (19,56,69–71) particularly during the tackle event (72). A study reporting on junior rugby injuries in 1997 found an injury incidence of 13.2/1000 player hours (72). Similar injury incidences (15.5/1000 player hours) were reported for New Zealand junior rugby players age between 6 -15 years (73). In contrast, during the 2008-2009 English community club season, higher incidence of injury of 24/1000 player hours for players between the ages 9 years to 17 years were recorded (74). Furthermore, the incidence and severity of injuries increased as players got older (74). The differences in these results may be attributed to the different research methodologies, definitions for injuries, and varying age classifications studied (74).

In a study assessing injury rates in both junior soccer and rugby union, most (66%) injuries to junior players occurred during matches, less (20%) during training and the least (15%) due to overuse injuries (68). Similar findings are reported in a different study with 56% of injuries occurring during match play (72). Junior rugby players incurred 67% of all injuries during contact events (68) with 59% of injuries occurring during the tackle (74).

Junior players are most likely to have injuries to the lower limb (72). While other studies showed injuries are more likely to occur at the knee, shoulder and head (68,74). With half of head injuries resulting in concussion (74).

Severity of an injury has been measured by the amount of time a player cannot participate due to the injury sustained (75). This time away from sport is classified as slight (0-1 days), minimal (2-3 days), mild (4-7 days), moderate (8-28 days) and severe (>28 days) (75). In terms of severity, 39% of rugby injuries were classified as mild (unable to play for a week or less), this could be due to players reluctance reporting these injuries (3). Similar studies, have used this classification to identify the severity of tackle injuries (23,66).

Given the nature of physical contact between bodies, the contact phases of play expose players to increase risk of injury (19,54,69,70,76). Of these contact phases, the tackle (24-58%) was associated with the most risk of injury, followed by the ruck (6-17%), maul (12-16%), collision (8-9%) and scrum (2-9%) (6). Note, even though the tackle is associated with the highest risk of injury, both the scrum and tackle is associated with the most severe injuries i.e catastrophic injuries (59).

2.5 Tackle Injury Epidemiology and Risk Factors

Both the ball-carrier and tackler are at risk of injury during the tackle (16–20,22–24,77). During the tackle, tacklers are more commonly associated with injuries to the head/neck and/or shoulder region (17,25,56). This could be due to the tackler tackling too low and coming into contact with the moving legs of the ball-carrier (23,66). Whereas the ball-carrier (the tackled player) is more susceptible to lower limb injuries (53). This may be due to the anatomical area that players use to tackle or areas struck during contact, and tacklers loading their body weight onto the legs of the ball-carrier (10). Contact between the tacklers head/neck and the ball-carriers lower limbs is associated with the highest risk of injury during match play (15).

Most tackle related injuries are sustained during matches (83.9/1000 player match hours) and full contact activities during training (3.5/1000 player training hours) (66). It has been reported that backs may have a higher risk of injury during the

tackle (both as tackler and ball-carrier); while forwards may have a greater risk during rucks, mauls, line outs and scrums due to their increased involvement in these contact areas of play (23,56,78).

The type of tackle may influence whether the ball-carrier or tackler are at higher risk of injury. Fuller et al (2010) report that the ball-carrier has a higher propensity to injury during one-on-one and double-tackles. The tacklers who perform the double-tackle are likely to collide with each other and cause injury (25). Tacklers were more likely to be injured if their head position was in front of the ball-carrier instead of above or next to the ball-carrier (25). Furthermore, tacklers are injured more frequently during front-on and side-on tackles (23). Quarrie and Hopkins reported that tackles from the front caused 77 injuries and tackles from the side caused 43 injuries to the tackler compared to other types of tackles such as, a tackle from behind causing 9 injuries (23). Illegal tackles such as, high and spear tackles, have been observed to result in catastrophic spinal (cervical) and spinal cord injury (65,79,80).

2.6 Risk Factors For Tackle Injuries

The risk of injury in sport is the probability or likelihood that harm will occur when exposed to, or engaged in, a particular activity (81,82). It follows that factors that influence the probability or likelihood of harm are considered injury risk factors (81,82). For example, for tackle injury, risk factors have been identified for the ball-carrier (22,23), tackler (23,24) or both (16–21). These risk factors may be proximal to the injury event. Examples of factors that influence the risk of injury when engaged in the tackle are speed of collision, high impact force, direction from which the tackle is entered and body regions contacted by the opponent and ground (10,23,25,26). The risk factors may also be distal to the injury event. These risk factors influence the risk of injury before the player engages in the tackle (25,83). The factors distal to the injury event may be intrinsic or extrinsic. Intrinsic risk

factors may include: age, body composition, knowledge of technique, implementation of technique, physical and mental capacities, previous injury, attitude and genetics (27–31). Extrinsic risk factors include: coaching, training, behaviour, equipment, and environment (27,28,30–32).

Incorrect tackle technique has been identified as a risk factor for injury among schoolboy rugby players (32). Injury prevention programs in New Zealand have focussed on proper technique during the tackle event for the tackler and ball-carrier (43). Studies have noted that poor contact technique results in injury, particularly when the tackler drops his or her head before contact, increasing the risk of hyperflexion of the cervical spine upon contact with the opposition player or ground (84,85). Education programs that focus on keeping the chin off the chest, eyes focused on the point of contact and being aware of the opponent's movements before engaging in the tackle may help reduce the risk of this type of injury (23).

In rugby, poor physical fitness and limited training have been reported as risk factors for injury (86–88). Appropriate conditioning is required to win this contest as either a ball-carrier or tackler. In rugby union, there is limited research on physical conditioning and success in the tackle. In rugby league however, a number of studies have been reported (14,52,89,90). Presuming that the demands of the tackle in rugby league are similar to the demands in rugby union, the same approach to conditioning in rugby union can be used. Gabbett (2009) reports that more skilful tacklers have higher levels of mesomorphy, acceleration and change of direction speed (90). Another study found that fatigue causes a reduction in tackle technique (89). Tackle technique is associated with physical conditioning components of the player, such as endurance, change of direction speed and anticipation skills (89). Furthermore, as the season progresses the tackle skill of players improves, and they become physically conditioned to high impact collisions. As such, there should be gradual tackle training during the pre-season (21).

Applying injury prevention models to rugby union, the risk factors for the inciting incident have not only been addressed. Knowledge, attitudes and behaviours of coaches' and players' have been identified as risk factors for injury in sport and rugby union (33–35). Moreover, knowledge, attitudes and behaviours of safe and correct techniques have been reported for the tackle in rugby (27,28,30,31,35,91).

2.6.1 Knowledge, Attitudes and Behaviours

Attitude refers to *"the knowledge and beliefs of a person concerning the specific consequences of a certain type of behaviour"* (31,92). Behaviours include players training habits, on-field actions, use of equipment and interaction with coaches, opponents, referees and teammates. Off the field behaviours which may affect performance include diet or sleep (27,31,32,36,93). Other determinants of behaviour include social influences, self efficacy (the ability to perform a specific skill) and attitude (27,31,32,36,93).

The relationship between knowledge, attitude and behaviour (KAB pathway) is modelled on the assumption that knowledge will modify attitude and in turn adapt the behaviour of an individual (36). The adapted behaviour may then reinforce or change the attitide of the individual, which may then review re-adapt his/her behaviour (36). This model has been used in both the public health sector (37,38) and for sport injury prevention initiatives (40–42,58,94,95). In particular, rugby injury prevention programs such as RugbySmart (40,43,94), BokSmart (58), SmartRugby (42), IRB RugbyReady (95) function on the notion that if coaches, referees and management are educated on best practices to reduce the risk of injury and manage injury, this would not only change their (coaches, referees, and managers) attitudes and behaviours towards safety and preventing injury, but ultimately change the attitudes and behaviours of players (39,40,43).

Coaches are targetted for these injury prevention programs because coaches are generally responsible for players' well-being, and govern players' activities during training and matches (10,96). Players are considered the 'end products' of the injury prevention programs since their risk of injury needs to be reduced, and coaches knowledge and attitudes can influence whether such programs are utilised (57,96,97). In view of this, understanding the behaviour of coaches is important for injury prevention programs to be implemented effectively.

2.7 Coaching Behaviours and Methods

Sport coaches are responsible for creating a healthy environment for their teams that promotes positive attitudes and behaviours among their players. They do this by preparing training sessions, train appropriate skill execution for matches and generally controls the quality of the training sessions (98). The field of coaching is multifaceted, and a full review of the coaching literature is beyond the scope of this thesis. For detailed reviews on coaching see Cushion et al (2010) (99) and Harvey et al (2013) (100). For the purpose of this review, coaching behaviours regarding methods, approaches or techniques coaches use to train skill will be discussed.

One of the main responsibilities of coaches is to improve the current level of skill or performance of their players (101,102). Most coaches have predetermined styles of coaching, based on tried and tested methods (103). This could be due to coaches basing their coaching methods on their own playing experience (104,105). These behaviours of coaching may be stable however, they might not be individualised to the need of each athlete (106).

Coaching approaches have been described in the context of "training" and "playing" (107). For example, Ford et al. (2010) defined "training" as the specific development of techniques or skill, and "playing" was any training that involved specific aspect of the game such as, phases of play. Time spent on "Training" form was 65%, while

35% of time was spent on “playing” form (107). Traditional methods of coaching typically focus on the analysis and development of technique (108). The techniques are practiced until they are performed well enough for the game to be played (108,109). Similarly, Reid (2007) identified two coaching methods: prescriptive and discovery (101). Depending on the training environment coaches may use either method. The prescriptive method (similar to “training”) involves the coach giving specific instruction to the athlete or learner regarding the rules that underlie a particular movement pattern to assist learning. Instructional methods include verbal instruction, feedback, questioning and modelling (107). In the discovery method (similar to “playing”), there are no instructions given to the athlete or learner; however, a particular motor skill will be learned (101).

Verbal instruction and demonstration are often used by coaches however, these approaches could be overly prescriptive which may negatively affect skill acquisition (107,108,109). Skills learnt prescriptively are more likely to be forgotten by players than skills learnt through guided discovery (110,111). Also, Ford et al. (2010) found instructional coaching behaviour dominated, and suggested this may prevent players from developing problem solving skills (107). With that said, it is also shown that verbal instruction and demonstration could be very important for early skill development (113).

Traditional coaching methods implies that through repetition, technique will be autonomous (114). This may be useful when learning a new skill that has to be mastered quickly and later combining this with game play (102,115,116). In open skilled team sports, such as rugby, this is challenging because the environment is more dynamic (59,117).

In view of the more traditional types of coaching methods, different coaching approaches and philosophies have been established with more focus on skill acquisition through game play (103,118–121). As such, coaches are currently

moving away from traditional technique-based methods, previously mentioned, and utilizing more game based approaches, such as, Teaching Games for Understanding (TGfU) (119), Game Sense or Play Practice (122). Teaching Games for Understanding (TGfU) has been researched across different sports including tennis, hockey, football and rugby union (103,120,121,123). A recent study assessing coaches using the Tactical Game Approach (a derivative of TGfU) in rugby union, found that coaches had some difficulties with this method. The difficulties coaches experienced included: being less plan dependent, to develop a facilitators role to encourage player learning and allowing enough time for players to apply the knowledge in the game (120). Considering this, it has been suggested that TGfU method is implemented with a strong peer-based support system to ensure proper and effective execution by coaches (120). In view of this, it is important to understand how coaches learn new coaching methods and behaviours.

There is significant research in the area of coach learning. Researchers have identified three main methods coaches learn new coaching techniques; These include: formal, nonformal and informal methods (124–130). An example of formal learning are official coach curricular programs run by national governing bodies in sport and tertiary courses in sport or sport science resulting in professional accreditation (124,131). Nonformal learning includes, coaching seminars, workshops and clinics, whereas informal coach learning includes previous experience as a player, information learnt on the job or from others such as coaching colleagues and the internet (125–130). A review by Nelson et al (2006), identified that informal learning has the most affect on coach learning compared to formal and nonformal learning (124).

Although, coaching behaviour has been well documented in sports such as football, netball and Australian Rules Football (AFL) from an injury risk perspective, less has been done in rugby union in terms of studying coaching behaviour (9,35).

2.8 Coaching The Tackle

Recently, it was established that players tended to regard performance as being more important than safety during tackle training, which arguably may be the result of coaches not emphasising safety enough (35). With that said, the tackle is a physical contest, and while safety should be a focus, the aim of the tackle is to win the contact situation. In this regard, injury prevention programmes such as BokSmart (58), SmartRugby (42), RugbySmart (94) promote that safe techniques are also effective performance techniques (39,58,132).

For the tackle, the BokSmart program gives an explicit set of technical instructions to apply during contact (39,58,132). For example, coaching instructions for the tackler include - chin up facing the ball-carrier, close the space between the ball-carrier, launch into the tackle using your inside shoulder, keeping your head on the open side close to the ball-carrier's buttock (*cheek to cheek*) and bring the ball-carrier to ground (58,133). Coaches are also encouraged to coach different types of tackles and alternate between left and right sided tackles (39,132). For the ball-carrier contact skills, the BokSmart program suggests the ball-carrier should hold the ball in two hands, keep the face up and eyes open, take small steps, keep a low body position, focus on the point of contact, take a wide power step into contact, present the hard parts of the body to the tackler, protect the ball, drive through the tackle with the legs, and present and transfer the ball at the correct time (39,58,132). Apart from the injury prevention programs, techniques for effective ball-carrying contact techniques have been described using video analysis (11). Wheeler and Sayers (2009), suggest that a *good* ball-carrier strategy before and during contact is to keep a low body position, use a fending action to resist the defender, maintain strong leg drive after contact, not submit to the tackler and try to advance ball beyond the initial point of impact or "tackle-line" (11).

Both tackling and carrying the ball into contact are considered open skills as the execution thereof is dependent on task constraints such as the interaction with the opposition, and the changing match environment (117). For example, tacklers need to account for ball-carrier's size, speed, the direction the ball-carrier is running, position on the field, the tackler's direction and position relative to a set piece (ruck/scrum/line out) moments before engaging in a tackle (10). In this regard, it is recommended that contact skills for the tackle progress from controlled conditions to match-like conditions.

Coaches use different equipment to train tackling such as: tackle bags, tackle shield and body armour (35). Furthermore, depending on the goals of the coach, different layouts and dimensions can be used (35). Also, inclusion of other task demands such as a vision exercise, reaction exercise, ball skill exercise and/or fitness conditioning may aid the player's tackle skill development (52,89,90,134).

2.9 Conclusion

The ability to execute and engage in the tackle contest is important for success in rugby union. In addition, the tackle is a high injury risk event in rugby, and proper execution of contact techniques may reduce the risk of injury and increase the likelihood of tackle success. Coaches are educated on proper tackle contact techniques through national rugby injury prevention programs in an attempt to modify coaches' attitude and behaviour towards safety and performance in the tackle. Despite this, little is known about the knowledge, attitudes and behaviour of coaches in rugby. Furthermore, coaches seem to have different approaches to training skill, and this may influence the way the tackle is coached. In view of this, a potential area for future research is to study coaches knowledge, attitudes and behaviours when training the tackle.

Chapter 3
Knowledge, Attitudes and Behaviours of Top Junior (Under-19) Rugby Union Coaches Toward Training the Tackle

3.1 Introduction

The game of rugby union is dominated by frequent purposeful, high impact collisions called tackles. The tackle in rugby union is observed when a player in possession of the ball (ball-carrier) is impeded by an opponent(s) known as the tackler (23). The tackle has been associated with the highest incidence of injury compared to the other contact phases of play, and a key determinant of team performance (6,7). Accordingly, many studies have been published on the tackle to further understand tackle performance and strategies to reduce injury risk(6,13–15,17,23,26). From these studies, a noteworthy strategy in reducing the risk of injury and performance in the tackle is the coaching of proper tackle technique (9,35).

Both the tackler and ball-carrier are at risk of injury during the tackle event (16–24). Factors that may increase the risk of injury during the tackle have been identified, and they primarily focus on the mechanism of injury (10,23,25,26). For example: speed of collision, high impact force, direction from which the tackle is entered and body regions contacted by the opponent and ground (10,23,25,26). Other factors that are either extrinsic (coaching, training, behaviour, equipment, and environment) or intrinsic (age, body composition, knowledge of technique, implementation of technique, physical and mental capacities, previous injury, attitude and genetics) have also been associated with injury in sport and may play a role in tackle injury risk (27,28,30–32).

Knowledge, attitude and behaviours of players and coaches have been identified as risk factors for injury in sport and in rugby union (33–35). As such, knowledge,

attitudes and behaviours of coaches have been identified as key factors for the implementation of sport injury prevention strategies, particularly in junior sport (9,10,57,97,135). Injury prevention programs offer coaches best evidence based practice in injury prevention and management of player injuries (39,40,43). Even though the primary aim of these injury prevention programs is to educate coaches, the repercussion of this is that the information is filtered down to players to modify players' attitudes and behaviours (39,40,43). Despite this model, not much is known about coaches knowledge, attitude and behaviour in rugby union in comparison to other football codes (57,96,97,135,136), and even less is known regarding training the tackle. In rugby union, two studies have adressed the knowledge and attitudes of coaches with regards to injury (9,137). In a sample of 35 junior rugby coaches from Townsville, Australia, 71% (n=25) of coaches identified the tackle as the phase of play with the highest risk of injury, but at the same time reported increasing technical knowledge for ball carrying and tackling less frequently (9). In the second study, 44 school coaches from Ireland were surveyed on their knowledge on the management and prevention of serious neck injuries (137). Eighty-one of coaches identified the tackle as the facet of play with the highest risk of injury, and reported that 'vigilant' coaching and adequate physical fitness as a preventative measure to reduce the risk of injury (137).

Given the high risk of injury associated with the tackle in rugby union and the influence effective engagement in the tackle has on the outcome of a match, appropriate coaching strategies for proper tackle contact technique and safety have been highlighted (10). Despite these documented instructions for coaches on the tackle, little is known about the current coaching techniques used to train the tackle in junior (under-19) rugby players.

3.2 Aims and Objectives

3.2.1 Aims

With the above background in mind, the purpose of this study is to; 1) report on the knowledge, attitudes and self-reported behaviours of top-level junior (under-19) age group) rugby union coaches, 2) to record actual tackle training behaviour of top-level junior (under-19) rugby union coaches. Top-level in this study refers to the top league for school under-19 players in this region.

3.3 Methods

3.3.1 Study Design

This study design is cross-sectional. With the main focus of the study on the observation of top-level junior (under-19) rugby union coaches behaviours when coaching the tackle. The rationale behind the study design was to establish coaches actual tackle training behaviours when training junior (under-19) rugby union players. This would be used, potentially, as a baseline for further research done in this popuation of coaches. This study consisted of 2 parts. In the first part coaches were administered questionnaires. The questionnaire assessed the knowledge, attitudes and self-reported behaviours of coaches. For the second part of the study, the training sessions of each coach were observed for 4 weeks to record actual training behaviour.

3.3.2 Participants

All eight schools participating in the Western Province Rugby Premier A1 division were approached and participated in this study. This represented 100% of top-level junior (under-19) rugby coaches in the region. The population of coaches was both purposive and conveniently selected due to the schools level of rugby as well as their geographical location in the Western Cape. All schools participating in the study received regular and organised coaching. The coaches were invited to participate in the study with the broad outline of general rugby training, without explicitly telling them that tackle training was the main focus of this study.

The mean coaching experience was 14 years (±4 years). Seventy-five percent (n=6) were level 2 qualified, 13% (n=1) level 3, and 13% (n=1) had not completed any of the formal coaching courses. All the coaches had completed the BokSmart course. Thirteen percent (n=1) had a tertiary qualification (bachelor's degree in sport science) and twenty-five percent (n=2) of coaches had completed an elite coaching course. The 3 highest coaching levels were the French 1st Division (n=1), Vodacom Cup (n=1) and the Currie Cup (South African provincial level) (n=1).

3.3.3 Measures

The Questionnaire

The questionnaire was modelled and developed mainly on a previous research paper on the attitudes and behaviours of junior rugby union players towards training the tackle (35). In order to include the themes of injury prevention and player safety, coaching literature was used as well as literature pertaining to injury prevention when developing the questionnaire (9,10,96). A pilot study was conducted to test the use of the questionnaire and improve overall validity. The validity of a measurement is the ability for the instrument to measure what it intends to measure (138). There

are four basic types of validity: logical, content, criterion and construct (138). In this particular study, logical validity was used. This is to say, the test claimed to measure coach knowledge, attitude and self-reported behaviour toward the tackle.

The aim of the self-reported questionnaire was to gain an insight into the knowledge, attitudes and self-reported behaviour of coaches towards coaching proper contact techniques in the tackle. A hard copy of the questionnaire was presented to each coach, with the choice of either completing the questionnaire immediately, or returning it at a later stage. Two coaches completed and returned the questionnaire immediately, and the remaining six coaches returned the completed questionnaires within one month. Coaches were only asked to complete the questionnaire, without any further instruction. Previous research indicates that researchers need to take into account that participants are giving a honest or degree of an honest answer (139). Understandably, a limitation of questionnaires is that participants may lie or give dishonest responses (139). As such, in this study we can only assume that coaches are giving the most honest and accurate responses.

Questionnaire Layout and Design

Based on work in this area with junior rugby players a list of questions was compiled to address the aims of the study. The list was presented to sport scientists, rugby administrators and clinicians for comment and further discussion before finalisation. This process was conducted three or four times until the list of questions was completed. Questions were guided by previous research done on the tackle (10,14,26,140,141). Once the questions were finalised the layout, questionnaire design and structure were completed.

Close-ended questions were used and considered to be most appropriate for this study. The close-ended questions provided the coaches with pre-determined answers

(items). The items were selected based on their relevance to a particular question and based on their specificity to this study.

Accordingly each question consisted of i) the question, ii) the item- the list of possible answers pertaining to the specific question posed, iii) response category- a 5-point Likert Scale represented by a numerical value where coaches had to indicate importance, frequency and quantity of each item for the question (Figure 1). In some questions a “Not Familiar” option was given, so coaches did not give a random answer if they were not sure. A comment column was included in all questions, so coaches could add any extra information they thought was relevant.

The tackle-coaching questionnaire consisted of a cover page where coaches filled in their background information (years of experience coaching, highest level of coaching, coaching courses, BokSmart course, tertiary education, exercise science degrees, other coaching courses). The remainder of the questionnaire consisted of 1 knowledge question, 5 attitudinal questions and 6 behavioural questions.

In terms of layout, questions were in separate boxes to one another and each question was colour coded differently so participants could differentiate between questions, item and response easily. All the columns were equal in width, to avoid participants having preferential answers. There were no more than three questions per page, to make the questionnaire easy to follow (Appendix A).

Knowledge

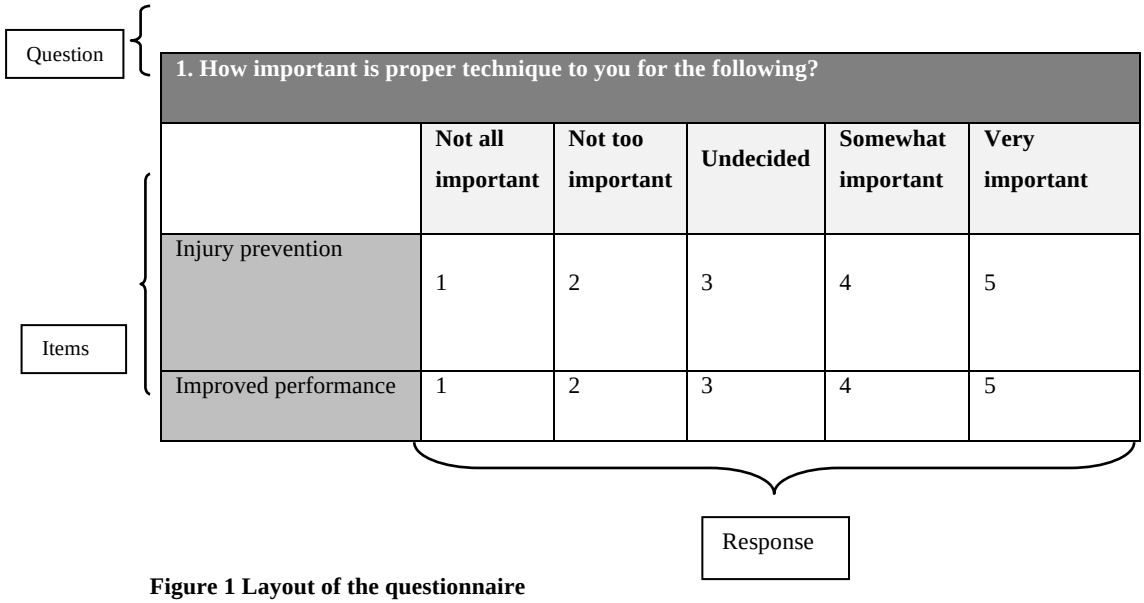
To assess knowledge the numerical value indicated the risk of injury for different facets of play: 1=Very low risk, 2= Low risk, 3= Undecided, 4= High risk and 5= Very high risk.

Attitude

To assess attitude the numerical value represented the importance of the item: 1= Not at all, 2= Not too important, 3=Undecided, 4= Somewhat important and 5= Very important.

Behaviour

To assess self-reported behaviour the numerical value represented how much they performed each item: 1= Not at all, 2= A little, 3= A fair amount, 4= Much and 5= Very much.



1. How important is proper technique to you for the following?					
	Not all important	**Not too important**	**Undecided**	**Somewhat important**	**Very important**
Injury prevention	1	2	3	4	5
Improved performance	1	2	3	4	5

Figure 1 Layout of the questionnaire

Four-Week Training Plan Record

The four-week training plan record was coordinated with the four-week observational period. It included non-contact training drills such as: Aerobic/Cardio/Endurance conditioning, attacking play, attacking strategy, backline

plays, combining conditioning drills with contact skills training, cool down, decision making drills, defensive play, defensive strategy, kick-offs, position specific drills, speed/agility/quickness/reaction time, strategy, stretching, warm-up and wrestling/static exertion exercises. The contact phases of play included: carrying the ball into contact, falling after contact, lineouts, mauling, offloading in contact, rucking/breakdown, scrumming and tackling. Each team only had three field training sessions per week. This was done to standardise the study.

3.4 Procedure

3.4.1 Observed Training Behaviour

All field-training sessions were observed at each school over a 4-week period. This amounted to 96 observed sessions in total. From the initial study proposal, observations of training were planned to take place four weeks prior to the first official game of the season, which would have occurred simultaneously with the *pre-season*. However, the 8 school's sporting and rugby activities differed from each other and a standardised 4-week observation period was not logistically possible during the *pre-season*. Accordingly, to standardise the observational time for each school, the first day of the second term was used as the starting point, which was planned during the first four weeks of the *in-season* (Figure 2).

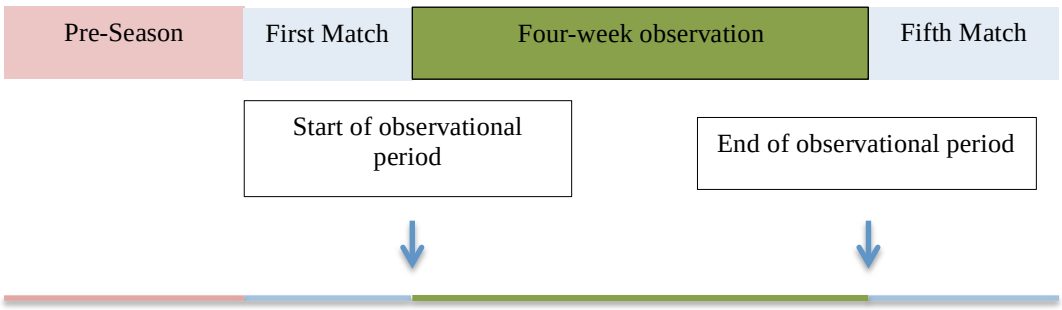


Figure 2 Timeline of four-week observation period

3.4.2 Tackle Training Record

To record all the tackle-training activities during the observed training sessions, a tackle training record was developed (Appendix B). The record comprised ten tackle-training behaviours that coaches could potentially use during a training session. The tackle record was also designed to be clear, and easy to document any potential tackle training behaviour.

The first behaviour on the record was whether the drill was specific to the tackler, ball-carrier or both. Then, what was the type of instruction given to players, i.e *verbal instruction and no demonstration* or *verbal instruction and demonstration,* with an option of "other". Thereafter, the layout of the drill was recorded. The options for the layout of the drill were *a small grid and controlled conditions*, *small grid and less controlled conditions, large grid and controlled conditions* or *large grid and less controlled conditions*. A large grid was considered to be an area greater than a 10m by 10m space whereas a small grid was smaller than 10m by 10m space. Controlled conditions indicates that the coach gave instruction to players on which direction to run or tackle to perform, whereas, less controlled conditions indicates no instruction was given to players.

The 5th item on the record noted the type of equipment used during the tackle. To identify specific tackle equipment used, the available options were the *shield*, *tackle bag*, *body armour* and *no equipment was used*. Thereafter, the type of tackle, either *front-on, side-on, smother, behind* and/or *double* tackle could be recorded.

The next behaviour recorded was on the type of emphasis the coach gave to the players. This included emphasis on *safety, injury prevention, technique, performance* or *no particular emphasis given*. *Safety* was emphasised if the coach instructed the player (ball-carrier or tackler) to protect himself, whereas *injury prevention* was recorded if the coach instructed the player to avoid injury. *Technique* was

documented if the coach instructed the player on the any technical component of the tackle, and *performance* was emphasised if the coach instructed the player to focus on the outcome of the tackle (whether as a ball-carrier or tackler).

The following behaviour documented was whether the tackle drill was combined with another type of drill. These drills included *ball skill exercise*, *vision exercise*, *reaction exercise*, *fitness exercise* or *no combination*. A *ball skill exercise* comprised of any ball handling drill. A *vision exercise* was recorded if players had to perform a task (for example tackling) while responding to a visual prompt. *Reaction exercise* referred to an exercise where a command or cue was given and the player had to react to the cue as quickly as possible. A fitness exercise involved any form of physical conditioning drill. Finally, the number of tackle drills per session was recorded, as well as the total time spent on the tackle drill or drills in the session.

To observe and record tackle training, eight observers who were independent of the team were recruited. The observer had to be available to attend all training sessions over the 4-week period, be independent of the observed team, and had to undergo a short instruction course on using the tackle training record. Each observer's reliability for using the tackle training record was also checked. During the training observation, observers had to strategically position themselves in an unobtrusive way so they did not influence or disrupt the coach and training in any way.

3.4.3 Using The Tackle Training Record

On an individual basis, each observer received instructions on observing tackle training and how to record the observations on the tackle training record. In particular, differentiation had to be made between tackle training and defensive training. Once the observer was familiar and comfortable with what was required during the observation and filling out a training record, the reliability of the observer was checked using video footage of two training sessions independent of the study.

One of the videos was distinctly tackle training, and the other, on defensive training. For each of the reliability training sessions, a criterion tackle training record was used to compare with the observer's tackling training record. Throughout the short course, observers were free to ask questions if any aspect of the training record was unclear.

The video footage was presented to the observers on a laptop (Hewlett Packard, model: dv6, manufacturer: Hewlett Packard). After viewing the video footage, each observer had to record the session using the tackle training record. Thereafter, the observer's completed tackle training record was compared with the criterion. For the first video, which consisted of the tackle drill, there was an almost perfect agreement between 4 independent observers and the criterion ($\kappa=1$, $\kappa=1$, $\kappa=1$ and $\kappa=0.81$, respectively). The remaining 4 independent observers had a substantial agreement ($\kappa=0.79$, $\kappa=0.76$, $\kappa=0.76$, $\kappa=0.62$) with the criterion (142). For the second video, which consisted of the defensive drill, all the independent observers had an almost perfect agreement ($\kappa=1$).

The reliability of the independent observers was further assessed during the actual observation period. To do so, the primary researcher observed and recorded one training session for each school over the 4-week period. The researcher's completed tackle training record for each school was then compared with the respective independent observer of the school. There was an almost perfect agreement between all the independent observers and the researcher ($\kappa=1$). This confirmed the inter-tester reliability between the primary investigator and independent observers was good.

3.5 Pilot Study

Before the main study, the questionnaire, tackle training record and observed training sessions were assessed during a pilot study. The purpose of the pilot study was to identify any challenges or difficulties with administering the questionnaire and performing the observations, and to improve on the logistics of the main study. For the questionnaire part of the pilot study, coaches were given the questionnaire before the intended observational period. Only two observers were available at two schools, respectively, during the pilot study.

The pilot study allowed for the identification of unclear or incomprehensible questions, as well as identifying logistical issues with observing rugby training sessions. For the pilot study, all eight top-level rugby school coaches in the Western Cape were approached, and only 7 participated (88% of the population). Observations were only carried out at two of the seven schools for two weeks. The pilot study took place during the second half of 2012 schoolboy rugby season.

Valuable insight on coaches' attitudes and behaviours were collected from the pilot questionnaire and published separately from the main study (91). Based on the pilot study, additional questions were added to the final questionnaire. In particular, a question assessing knowledge and additional questions assessing tackle training behaviour were added.

3.6 Ethical Approval

Ethical approval for this study was provided by the University of Cape Town, Faculty of Health Sciences, Human Research Ethics Committee (HREC REF: 525/2010) (Appendix C). Approval for this study was also received from the Western Cape Education Department (Appendix D). While, there was an element of 'deception' involved in this study, coaches would be informed of the true nature of the observations on completion of the study. The completed thesis will also be mailed to all the coaches who participated. The completed thesis will also be mailed to all the coaches who participated. By withholding the true nature of the observations from the coaches it did not cause any harm to them. As such, the study satisfies all criteria for research involving deception of participants, concealment or covert observation (Ethics in Health Research: Principles, Structures and Processes, Ethical Guidelines 2004, page 46) (Appendix E).

3.7 Data Analysis

For analysis and reporting purposes, data were separated into two sections: i) Questionnaire and ii) Observations. For section (i) (questionnaire), data has been represented descriptively as percentages and mean scores for each item. Percentages were calculated by dividing the number responses by the total number of coaches who responded to a particular item. In addition to the percentages, the mean rating and 95% confidence interval (CI) were also calculated for each item. For the coaches coaching experience, the mean value and standard deviation (±SD) was calculated. For the 4-week training plan question, mean number (±SD) of training sessions per week for each activity are reported.

For section (ii) (observations) all the activities were added for the observed tackle training sessions at each of the schools and represented as numerical values (the counts for training sessions were totalled). Percentages of each activity were

calculated by dividing the counts of each behaviour by the total amount of observed tackle training drills (n=15). For tackle drill time, total time was calculated for each week by adding all the tackle training sessions (time) per week.

To compare coaches reported tackle behaviour and observed tackle behaviour, descriptive statistics were provided. The reported tackle training behaviour of the coaches was compared to the observed tackle behaviour. For this comparison, the number of coaches' responses was compared.

3.8 Results

3.8.1 Questionnaire

Knowledge

When asked which phase of play would expose a player to the highest risk of injury, on a scale of 1=very low risk to 5=very high risk, tackling (3.9; 95% CI 3.3-4.4), rucking (3.8; 95% CI 3-4.5), ball carrying (3.6; 95% CI 2.6-4.6) and scrumming (3.4; 95% CI 2.5-4.3) were rated with the highest risk (Table 1). Proper technique for catching and passing (1.9; 95% CI 1.3-2.4) was rated as having the least risk to injury.

Table 1 Coaches reported risk of injury in different phases of play. Data are reported as percentage frequencies (%) in each response category and mean ratings of importance with 95% confidence intervals (CI)

	Very low risk	Low risk	Undecided	High risk	Very high risk	Mean	95% CI
Phases of Play	**%**	**%**	**%**	**%**	**%**		
Tackling	-	-	25	62.5	12.5	3.9	3.3 - 4.4
Rucking	-	12.5	12.5	62.5	12.5	3.8	3.0 - 4.5
Ball-carrying	-	25.0	12.5	37.5	25.0	3.6	2.6 - 4.6
Scrumming	-	25.0	25.0	37.5	12.5	3.4	2.5 - 4.3
Maul	-	50.0	37.5	12.5	-	2.6	2.0 - 3.2
Falling to ground	12.5	50.0	37.5	-	-	2.3	1.7 - 2.8
Line out	12.5	62.5	25.0	-	-	2.1	1.6 - 2.7
Catching and passing (ball handling)	25.0	62.5	12.5	-	-	1.9	1.3 - 2.4

Attitude

Sixty-two percent (n=5) of coaches rated proper technique as *very important* and 38% (n=3) rated proper technique as *important* to prevent injuries during the tackle. For improving tackle performance, 75% (n=6) of coaches rated proper technique as *very important*, with 25% (n=2) rating it as *important*.

All (n=8) coaches indicated that proper technique was *very important* for lineouts, rucking, scrumming and ball handling. Eighty-eight percent (n=7) of coaches reported proper technique of ball carrying and tackling as *very important*, and the remaining 13% (n=1) reported proper technique for ball-carrying and tackling as *important*. Seventy-five percent (n=6) of coaches rated proper technique for falling

to ground and mauling as *very important*, the remaining *25%* rated the two items as *important*.

Thirty-eight percent (n=3) of coaches reported that a technique that reduced the risk of injury would also improve performance *very much*, 50% (n=4) reported *much* and 12% (n=1) *a fair amount*. In comparison, 50% (n=4) of coaches reported that techniques that improve performance could reduce the risk of injury *very much*. Twenty-five percent (n=2) indicated *much*.

Mean ratings of the importance of tackle technique were ranked for a) injury prevention and b) improving performance (Table 2). To lower the risk of injury coaches rated giving verbal instruction and tackling drill combined with fitness exercise (mean 4.5; 95% CI 3.9-5.1), demonstration (mean 4.4; 95% CI 3.8-5.0), tackling drill combined with ball skill exercise (mean 4.4; 95% CI 3.8-5.0) and using body armour (mean 4.4; 95% CI 3.6-5.1). Coaches rated tackling drill combined with fitness exercise (mean 4.5; 95% CI 3.9-5.1), tackling drill combined with reaction exercise (mean 4.4; 95% CI 3.7-5.1) and tackling drill combined with vision exercise (mean 4.3; 95% CI 3.7-5.2) as most important for improving tackle performance. Coaches rated using tackle bag the least important for injury prevention (mean 3.4; 95% CI 2.2-4.6) and improving performance (mean 3.1; 95% CI 1.9-4.3).

Self-Reported Behaviour

Resources most often used to develop new coaching methods and techniques were own playing experience (50% *very much*; mean rating 4.5; 95% CI 4.0-4.9), televised rugby matches (25% *very much*; mean rating 4.0; 95% CI 3.4-4.6), attending live rugby matches (50% *very* much; mean rating 4.0; 95% CI 3-5) and coaching colleagues (12.5% *very much*; mean rating 3.9; 95% CI 3.2-4.6) (Table 3). Scientific journal articles (50% *not at all*; mean rating 1.8; 95% CI 1-2.5), IRB website (37.5%

not at all; mean rating 1.6; 95% CI 1.1-2) and BokSmart website (50% *not at all*; mean rating 1.6; 95% CI 1-2.2) were indicated as the least often used.

Table 2 Mean ratings of importance of drills used by coaches when training the tackle for a) injury prevention, and b) improving performance. Data are reported as percentage frequencies (%) in each response category and mean ratings of importance with 95% confidence intervals (CI)

a) Injury Prevention			**b) Improving Performance**		
Drill	**Mean**	**95% CI**	**Drill**	**Mean**	**95% CI**
Giving verbal instruction	4.5	3.9-5.1	Tackling drill combined with fitness exercise	4.5	3.9 - 5.1
Tackling drill combined with fitness exercise	4.5	3.9-5.1	Tackling drill combined with reaction exercise	4.4	3.7 - 5.2
Demonstration	4.4	3.8-5.0	Tackling drill combined with vision exercise	4.4	3.8 - 5.0
Tackling drill combined with ball skill exercise	4.4	3.8-5.0	Using body armour	4.4	3.6 - 5.1
Using body armour	4.4	3.6-5.1	Tackling drill combined with ball skill exercise	4.3	3.5 - 5.0
Live tackling in a 1-vs1 player grid	4.1	3.4-4.8	Demonstration	4.1	3.4 - 4.8
Tackling drill combined with reaction exercise	4.1	3.4-4.8	Giving verbal instruction	4.0	3.0 - 5.0
Tackling drill combined with vision exercise	4.1	3.4-4.8	Live tackling in a 1-vs1 player grid	3.9	2.9 - 4.8
A full contact practice match	3.9	2.9-4.8	Using shield	3.6	2.7 - 4.5
Using shield	3.8	2.9-4.6	A full contact practice match	3.5	2.7 - 4.3
Using tackle bag	3.4	2.2-4.6	Using tackle bag	3.1	1.9 - 4.3

Coaching methods that included the entire team, either verbal instruction to the entire team (88% *very much*; mean rating 4.8; 95% CI 4.5-5.1), identifying a team problem and coaching accordingly (88% *very* much; mean rating 4.8; 95% CI 4.5-5.1) or demonstration to the entire team (63% *very* much; mean rating 4.6; 95% CI 4.1-5) were reported most often used by coaches. Individual based coaching methods such as individual 1-on-1 verbal instruction (64% *very much*; mean rating 4.2; 95% CI 3.3-5.1), identifying a problem in a player and coach the player individually (63% *much*; mean rating 3.6; 95% CI 3.1-4) and individual 1 on 1 demonstration (37% *very much*; mean rating 3.3; 95% CI2.9-3.8) were used less often.

Mean ratings were ranked for methods that influence coaches' ability to coach technique for a) injury prevention and b) improving performance for the tackle (Table 4). Coaches rated using communication to players (mean 4.6; 95% CI 4.2-5.1), fully understanding the technical components of the skill (mean 4.5; 95% CI 3.9-5.1) and own experience (mean 4.5; 95% CI 3.9-5.1) as the most frequently used techniques for reducing the risk of injury in the tackle (Table 4). Attending coaching courses on techniques for safety (mean 3.4; 95% CI 2.0-4.7), access to scientific information on technique (mean 3.1; 95% CI 2.2-4.1) and access to coaching education and information resources (mean 2.9; 95% CI 1.7-4.0) were the least often used. To improve performance, communication to players (mean 4.8; 95% CI 4.4-5.1), fully understanding the technical components of the skill (mean 4.8; 95% CI 4.4-5.1) and own experience (mean 4.4 95% CI 3.8-5.0) has the most influence on the coaches' ability to train a technique. Coaches were influenced least by access to scientific information on technique (mean 3.6; 95% CI 2.6-4.6), attending coaching courses on techniques for safety (mean 3.1; 95% CI 1.8-4.4) and access to coaching education and information resources (mean 2.9; 95% CI 1.9-3.8).

Table 3 Reported use of resources to develop knowledge and new training methods. Data are reported as percentage frequencies (%) in each response category and mean ratings of importance with 95% confidence intervals (CI)

Resources	Not at all %	A Little %	A fair amount %	Much %	Very much %	Importance Mean	95% CI
Your Own Playing Experience	-	-	-	50.0	50.0	4.5	4.0 - 4.9
Televised Rugby Matches	-	-	25.0	50.0	25.0	4.0	3.4 - 4.6
Attending live rugby matches	-	12.5	25.0	12.5	50.0	4.0	3.0 - 5.0
Coaching Colleagues	-	12.5	-	75.0	12.5	3.9	3.2 - 4.6
Coaching Clinics	-	25.0	50.0	12.5	12.5	3.1	2.3 - 4.0
Attending formal coaching/physical education courses	-	37.5	37.5	-	25.0	3.1	2.0 - 4.2
Rugby Training Videos	25.0	25.0	-	25.0	25.0	3.0	1.6 - 4.4
Attending workshops	-	37.5	50.0	-	12.5	2.9	2.0 - 3.7
Internet	25.0	25.0	-	37.5	12.5	2.9	1.6 - 4.1
BokSmart DVD and Materials	25.0	25.0	-	37.5	12.5	2.9	1.6 - 4.1
Sport/Rugby Shows on TV	12.5	37.5	25.0	12.5	12.5	2.8	1.7 - 3.8
Rugby Training Books	25.0	37.5	-	37.5	-	2.5	1.4 - 3.6
Newspapers	50.0	12.5	12.5	-	25.0	2.4	0.9 - 3.9
Rugby Magazines	50.0	25.0	12.5	12.5	-	1.9	0.9 - 2.8
Scientific Journal Articles	50.0	25.0	25.0	-	-	1.8	1.0 - 2.5
IRB Website	37.5	62.5	-	-	-	1.6	1.2 - 2.0
BokSmart Website	50.0	37.5	12.5	-	-	1.6	1.0 - 2.2

When coaches were asked ‘If the latest scientific data showed a new, improved way to coach tackle technique for safety, would they implement it?’ Fifty percent (n=4) of coaches responded *very much*, 25% (n=2) responded *much* and the remaining 25%

responded *a fair* amount. When coaches were asked 'If the latest scientific data showed a new, improved way to coach tackle technique for performance, would they implement it?' Sixty-three percent (n=5) of coaches responded *very much*, 25% (n=2) responded *much* and the remaining 25% responded *a fair* amount.

Table 4 Reported influence on coaches' ability to coach a specific technique for a) injury prevention, and b) improving performance. Data are reported as percentage frequencies (%) in each response category and mean ratings of importance with 95% confidence intervals (CI)

a) Injury Prevention			**b) Improving Performance**		
Technique	**Mean**	**95% CI**	**Technique**	**Mean**	**95% CI**
Communication to players	4.6	4.2 - 5.1	Communication to players	4.8	4.4 - 5.1
Fully understanding the technical components of the skill	4.5	3.9 - 5.1	Fully understanding the technical components of the skill	4.8	4.4 - 5.1
Own experience	4.5	3.9 - 5.1	Own experience	4.4	3.8 - 5.0
Training equipment	4.1	3.4 - 4.8	More time during training	4.4	3.6 - 5.1
More time during training	3.4	2.3 - 4.5	Training equipment	4.3	3.7 - 4.8
Attending coaching courses on techniques for safety	3.4	2,0 - 4.7	Access to scientific information on technique	3.6	2.6 - 4.6
Access to scientific information on technique	3.1	2.2 - 4.1	Attending coaching courses on techniques for safety	3.1	1.8 - 4.4
Access to coaching education and information resources	2.9	1.7 – 4.0	Access to coaching education and information resources	2.9	1.9 - 3.8

Thirty-three percent of sessions were planned to include a contact training component.

Table 5 Mean number of sessions that the training component was planned to train per week over the 4 -week observational period. Data are presented as numerical mean ratings of the number of training sessions per week with standard deviations (SD)

Training Component	Mean number of sessions trained per week (1-4)	Standard Deviation (±SD)
Stretching	3.0	±0.0
Warm up	3.0	±0.0
Defensive strategy	2.0	±1.0
Cool down	2.0	±1.0
Defensive play	1.7	±1.0
Decision making drills	1.7	±0.8
Backline plays	1.7	±0.7
Attacking strategy	1.6	±0.9
Line-outs	1.6	±0.7
Offloading in contact	1.6	±0.8
Strategy	1.5	±0.9
Kick-offs	1.5	±0.7
Falling after contact	1.4	±0.5
Attacking play	1.3	±0.7
Contact techniques/skills	1.3	±0.5
Rucking/breakdown	1.3	±0.5
Wrestling/Static exertion exercises	1.3	±0.5
Tackling	1.3	±0.8
Position specific drills	1.2	±0.7
Scrumming	1.2	±0.7
Aerobic/Cardio/Endurance conditioning	1.2	±0.4
Carrying the ball into contact	1.2	±0.4
Speed/agility/quickness/reaction time	1.1	±0.3
Combining conditioning drills with contact skills training	1.1	±0.3
Mauling	1.0	±0.0

Table 5 shows the mean number of sessions each training component was planned to train over the four-week period. The most frequently planned training components were stretching, warm up and defensive strategy. Speed/agility/quickness/reaction time, combining conditioning drills with contact skills and mauling training components were only planned for one session per week.

3.8.2 Observed Tackle Training Behaviour

In total, ninety-six training sessions were observed for the 8 schools over the four-week period. Of the 96 training sessions observed, 16% (n=15) included tackle training. Two schools did not train the tackle over the four-week observational period. The number of tackle training drills for each week were 5 (week 1), 5 (week 2), 3 (week 3), 2 (week 4). The time spent in total on tackle drills in the first week was 95 minutes, 88 minutes in week 2, 40 minutes in week 3 and 35 minutes in week 4. The mean duration of each individual drill was 17.2 minutes (SD 2.5).

Tackling drill specific tackler or ball-carrier

For the 15 observed tackle training drills, 40% (n=6) of the drills were specific to the tackler, 47% (n=7) were specific to the ball-carrier and 13% (n=2) specific to both ball-carrier and tackler.

Type of instruction to players

Coaches used ‘demonstration and verbal instruction’ in 67% (n=10) of the tackle training sessions, and ‘verbal instruction with no demonstration’ during 33% (n=5) of the tackling drills.

The layout of the tackle drill

A ‘large grid and controlled conditions’ was observed in 47% (n=7) of sessions and a ‘small grid and less controlled conditions’ was observed in 33% (n=5) of sessions. A

‘small grid and controlled conditions’ 13% (n=2) and ‘large grid and less controlled conditions’ 7% (n=1) were also observed.

Equipment used during the tackle drill

No equipment was used for 47% (n=7) of sessions. When equipment was used, the equipment of choice was the tackle bag, used in 3 sessions (20%), the shield, used 2 sessions (13%), or the combination of the tackle bag and the shield, used in 2 sessions (13%). The combination of the tackle shield and body armour was used during 1 session (7%).

The type of tackle during the tackle drill

The front on tackle was trained in 8 of the 15 (53%) tackle training drills, and the side on tackle in 3 of the tackle training drills (20%). The double tackle and tackle from behind (7%; n=1) were trained once each. In one training drill, both front on and side on tackles were trained. In another session, the front on, double and smother tackle were trained during a drill.

The type of emphasis used during tackle drills

During the 15 tackle training drills, it was observed that coaches frequently emphasized performance (47%; n=7) to the players, technique was emphasised 33% (n=5) and injury prevention 20% (n=3). In 1 training session, no particular emphasis was observed.

Other skills combined with tackle drills

In 6 (40%) tackle-training observations, tackle training was trained in isolation (i.e. not combined with another skill training drill). A reaction exercise was added for 20% (n=3) of tackle training sessions. Vision (13%; n=2) and ball skill (13%; n=2) exercises were also included with the tackle training.

3.8.3 Planned 4 week period vs Observed Tackle Training

When comparing the planned 4 weeks completed in the questionnaire, and the tackle training observed over the 4 weeks, 75% (n=6) of coaches over-reported on the number of sessions planned to train the tackle, 13% (n=1) under reported the number of tackle training sessions and the remaining 13% (n=1) of coaches trained tackling as reported.

On average, each coach intended to train the tackle 4 times a week over the four-week training period. During the observation, coaches were observed training the tackle 1.75 per week. Coach 4 did not intend to train the tackle and was not observed training the tackle with his players therefore no data was recorded.

3.9 Discussion

This study reported on the knowledge, attitude and self-reported behaviours of top-level junior (under-19) rugby coaches through the use of questionnaires and by observing tackle training behaviour. This investigation was the first to observe coaching behaviours when training the tackle event of junior (under-19) rugby players. In rugby epidemiology studies, the tackle event has been found to be associated with a high risk of injury, whether as a ball-carrier (22,23) or tackler (23,24). Seventy-five percent of coaches in the present study identified tackling as the phase of play associated with high-very high risk of injury, and 63% of coaches identified carrying the ball into contact as high-very high risk of injury. This may suggest that the majority of coaches in this study are aware of the high risk of injury associated with the tackle. These results echo findings from a similar study on 35 junior rugby union coaches in Australia, where 71% (n= 25) of coaches identified the tackle as a high risk phase of play compared to other phases (9). Given that all coaches in the current study are BokSmart accredited, it may be assumed that coaches acquired this knowledge through this program as the high risk of injury in the tackle is explicitly explained in the course (58,132,133). Two coaches did not think that tackling was a high-risk phase of play, and were undecided on the matter.

Sixty-two percent of the coaches thought that proper technique was very important to prevent injuries during the tackle, and 75% of coaches thought proper technique was important to improve tackle performance. This may indicate that coaches are aware of the technical needs that are required for making the tackle safe and effective. Carter and Muller reported that 71% (n= 25) of junior Australian coaches thought they needed more technical knowledge on the tackle (9). Even though coaches reported that technique is important for both safety and performance, during the observed tackle training sessions, coaches only emphasised performance and not safety. With that said, it may be argued that safety will not be explicitly expressed by coaches during training, even though safety may be a goal (143). This highlights a caveat in using observation alone to record training.

Seventy-five percent (n=6) of the coaches reported in the questionnaire they would train the tackle. For the training observations, 75% of coaches (n=6) performed 15 tackle drills during 96 observed training sessions over the four-week period, and 25% (n=2) did not train the tackle. In the first two weeks, five tackling drills were observed in each week. In the third and fourth weeks, tackle training was observed three and two times, respectively. Although the estimated frequency, type, and intensity of tackle training that needs to occur during the different phases of the season is yet to be reported for rugby union, a study on elite level rugby players (Super Rugby) reported skills training was done 4 times per week during the *pre-season* and decreased to 2-3 times per week during the competition phase (144). The KAB model is based on the assumption that knowledge will change attitude and then adapt behaviour (36). However in this study there is a discrepancy between coach's knowledge, attitudes and intended behaviour and the actual observed behaviour. This may indicate that the KAB model may not be true in this study. In a review by Lund et al (2004), it is suggested that information alone does not necessarily produce change in safety behaviour and on the incidents of injury except when groups are motivated (36). A reason for this could be that safety and injury prevention behaviours cannot be recorded, as they are more implicit behaviours. Whereas, behaviours regarding the type of tackle trained are explicitly expressed and easy to record.

Coaches reported that coaching methods were mostly developed by gaining information from colleagues who were coaches and watching televised and live rugby matches. Both sources of information are arguably not based on scientific evidence and best practice. The resources, least used by coaches included scientific journals, IRB website and BokSmart website. A review by Nelson et al (2006) reported that coaches might learn from formal, nonformal and self directed informal sources (124). Although informal, self directed sources have the highest impact on coach learning (124). A study of netball coaches in Australia showed coaching workshops (nonformal learning) were the best way to encourage injury prevention programs (136). It has also been reported that coaches find some of the scientific

literature difficult to understand due to the technical language (145). This suggests that researchers need to develop other means of conveying information to coaches. In view of this, it may be important to direct safety and injury prevention information through mediums or informal modes of learning that coaches are known to use and understand.

The front-on (n=8) tackle was the most frequently observed type of tackle practiced during training. The side on tackle (n=3) was trained less frequently, whereas the double tackle (n=1) and the tackle from behind (n=1) were trained the least. In the literature, the front-on tackle has been reported as the most frequently executed and injury inducing tackle during a rugby match (15,23). Based on this, it is appropriate that coaches are focussing training on the front-on tackle. However, incorporating other types of tackles (side on, double, smother and tackle from behind) into training may provide further gains in match performance and lower the risk of injury.

For the 15 tackle training drills observed in this study, coaches used padded equipment in 8 sessions (53%), designed the drill using a large grid with controlled conditions in 7 sessions (53%) and emphasised technique in 5 sessions (33%). No equipment was used in 47% (n=7) of tackle training sessions. This may highlight coaches creating more live or game like situations for the players. The most frequently used tackle training equipment was the tackle bag, in 33% (n=5) of tackle training drills. In a previous review, it was suggested the use of padded equipment may be useful when training the novice player to tackle, by decreasing the risk of injury during training (10). As the player's tackle skill increases though, less padded equipment can be used (35). The use of padded equipment may decrease the risk of injury during training compared to live tackling (with no equipment use), however, this may not prepare players adequately for contact with other players during matches.

Coaches used verbal instruction and demonstration to instruct players during tackle training. This is not surprising as instructional coaching behaviours are most frequently used by coaches (107). It has been recommended that more advanced players may require live tackling drills to recreate game-like situations to improve tackle skill (10,35,91). This is to say, that the tackle should be practiced until the player is able to execute the tackle safely and effectively in a controlled environment. Then to further improve the skill level of the player, other variables should be included with a tackle drill. For example a fitness drill or a handling technique (10). If the player is able to satisfy the aformentioned stages with ease, the player may benefit from more game-like situations drills (such as live tackle drills) (10,35,91). Indeed, the first team players in this study may have limited playing experience compared to senior players (amateur and professional), however they may have the highest pre-determined level of tackle skill at their current level of play. Therefore less explicit instruction may be required at this level. Based on this, coaches are encouraged to use a combination of explicit instruction and open play tackle drills to improve tackle skill of top-level junior (under-19) players.

3.9.1 Strengths and Limitations

This was the first study to observe and report on tackle training behaviour of an entire population of coaches using a novel tackle training record. Furthermore, the knowledge and attitudes of these coaches with regards to safety and performance when training the tackle were recorded using a questionnaire. The questionnaire and training record were based on previous research, and both the questionnaire and record were quite specific in what questions were asked and recorded to fulfil the purpose of the study. The training record also provided space for “other” and “comments” to reduce the chances of missing relevant information.

While the entire population of top-level junior (under-19) rugby union coaches were used for this study, it is understood the use of a small number of participants and generalising the findings may be a limitation. A possible solution to counter this

limitations would be to increase the number of coaches and utilize other populations of coaches within rugby. For example, senior, club level and junior players. With that said, a convenient and purposive population was used for this study given the geographical limitation.

The coaches completed the questionnaire on receipt, although they did not all return the completed questionnaire immediately. Only one coach completed the questionnaire and returned it during the observational period. This may have influenced some of his responses.

The questionnaire was logically valid and tested coaches knowledge, attitudes and self-reported behaviours toward the tackle. No internal and external validity tools were used in the process and may be a limitation of this study. However, the questionnaire did go through a process of being checked by sports scientists and coaches before being used in the study. With that said, the questionnaire was not the main focus of the study, with the main focus on the observed tackle training behaviour of the coaches.

Finally due to the elite level of coaching at this level, there may be a bias towards these players receiving the most consistent training and therefore one might not be able to generalise the results to different leagues.

3.10 Conclusion

Top-level junior (under-19) rugby coaches have positive attitudes towards tackle safety and performance. Coaches have also indicated good knowledge on the risk of injury associated with the tackle. Coaches reported learning new coaching methods were mostly developed through resources such as from colleagues who also coach and watching televised and live rugby matches. Seventy-five percent (n=6) of

coaches were observed training the tackle. Of the total number of training sessions observed, coaches trained the tackle 16% of the time. Given the importance of the tackle contact event in rugby union, it may be argued that this is insufficient tackle training.

The next step from this study would be to determine how much tackle training should occur during the pre-season and competition phase of the season to condition players without increasing their risk of injury. The latest research on ways to reduce the risk of injury and improve performance in the tackle should also be disseminated through the appropriate channels that coaches are known to use. For example, colleagues that coach, live rugby matches and televised rugby matches.

Best practice and guidelines for rugby training should be based on current scientific research in rugby, which may be incorporated into the coach's coaching approach to meet his or her training objectives. Guidelines should specify which coaching method or technique is effective for training safety or performance (or both). Although guidelines do exist, it is important that more information on the appropriate coaching methods specific to each coach's needs, level of coaching and level of player skill/age is provided. This should consider, what training drills to use, how to use them, when to use them, how frequently to use them, the correct duration and the intensity of each drill for the complete season.

Chapter 4
Summary and Conclusion

The high risk of injury associated with the tackle has been well documented (6,15–17). Some of the injuries associated with tackling can be severe and result in time away from the sport (56). One way of reducing the risk of injury and improving the efficiency of the tackle is by being coached proper tackle technique (10,57).

Previous studies have identified coaches knowledge, attitude and behaviour as risk factors (27,28,30,32). There have been many studies that have assessed coaches knowledge, attitudes and self-reported behaviours with the use of questionnaires (9,35,57,91). No study has conducted direct observation of tackle training in rugby union. As such, it is unknown if tackle training is occurring particularly at junior (under-19) level.

The overall aims of this study were to; 1) report on the knowledge, attitudes and self-reported behaviours of top junior (under-19) rugby union coaches 2) record actual tackle training behaviour of top-level junior (under-19) rugby union coaches.

Coaches demonstrated good knowledge regarding the risk of injury associated with the tackle event. With most reporting the tackle having a high (n=1) and very high (n=7) risk of injury. Coaches demonstrated positive attitudes toward tackle safety and improving performance. With a majority (n=5) of coaches indicating that proper tackle technique would improve tackle safety. Most coaches (n=6) reported that proper tackle technique would also improve tackle performance. Finally, coaches reported that they developed new coaching methods by watching live and televised matches, coaching colleagues and from their own playing experience. Coaches only intended to train the tackle twice per week. During the observed training period

coaches performed tackle drills in 15 training sessions. This was much less than the total amount of observed training sessions (n=96) across all the schools.

The coaches in this study were aware that the tackle is a high-risk phase of play, and that coaching proper technique is important for tackling and taking the ball into contact. A positive attitude was shown towards the importance of proper technique in reducing the risk of injury and improving performance. In the present study, details on actual tackle training behaviours were revealed. Even though it is difficult at this stage to establish whether this is sufficient for preparing the players for matches, the current findings provide a marker for future work on tackle training and coaching. The latest research on techniques to reduce the risk of injury and improve performance in the tackle should also be disseminated through the appropriate channels that coaches are known to use. It is also important that coaching guidelines incorporate different coaching approaches and be specific for each coach's outcome for the tackle training session. This should be dependent on each coach, the level of coaching as well as the skill of player/s.

Chapter 5

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APPENDICES

Appendix A

No:

- Questions are set out so that you may answer on a rating scale of 1 to 5 (except for Question 1). The meaning of each of the numbers will be given on top of the answer table unless stated otherwise.
- To indicate your answers make an **X** in the desired block.

1(a). Coach Information		**Date:** yyyy /mm/ dd
Surname		
First Names		
Club/School Name		
What is the highest level you have coached?	**Team**	**Competition**
What is your current level of coaching (i.e this season)?	**Team**	**Competition**
How many years have your been coaching (Managing a team: planning training sessions and game strategy)?	1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20>	

1(b). Have you completed any formal coaching/sport science/physical education course in the last 5 years?			
Yes		No	
	Level 1	Level 2	Level 3
If yes, please indicate course **(more than 1 course can be indicated)**	Level 4 or Higher	BokSmart Certification	Tertiary Qualification Specify_____
	Exercise Training Academy (ETA)	Other Specify_____	

2. How important is coaching proper technique to you for the following? (Assuming these are separate objectives)					
	Not at all important	**Not too important**	**Undecided**	**Somewhat important**	**Very important**
Safety *(lowering the risk of getting injured during the tackle)*	1	2	3	4	5
Improved performance	1	2	3	4	5

3. To further your coaching knowledge, or develop new training methods, how often to do use the following resources?					
	Not at all	**A little**	**A fair amount**	**Much**	**Very Much**
Attending formal coaching/physical education courses	1	2	3	4	5
Attending live rugby matches	1	2	3	4	5
Attending Workshops	1	2	3	4	5
BokSmart DVD and Materials	1	2	3	4	5
BokSmart Website	1	2	3	4	5
Coaching clinics	1	2	3	4	5
Coaching colleagues	1	2	3	4	5
Internet	1	2	3	4	5
IRB Website	1	2	3	4	5
Newspapers	1	2	3	4	5
Rugby Magazines	1	2	3	4	5
Rugby training books	1	2	3	4	5
Rugby training videos	1	2	3	4	5
Scientific Journal Articles	1	2	3	4	5
Sport/Rugby shows on TV	1	2	3	4	5
Televised rugby matches	1	2	3	4	5
Your own playing experience	1	2	3	4	5
Other(specify)/Comments:					

4. How often do you use the following coaching methods?					
	Not at all	**A little**	**A fair amount**	**Much**	**Very Much**
Individual one-one verbal instruction	1	2	3	4	5
Verbal instruction to the entire team	1	2	3	4	5
Individual one-one demonstration	1	2	3	4	5
Demonstration to the entire team	1	2	3	4	5
Identifying a problem in a player and coach the player individually	1	2	3	4	5
Identifying a team problem and coach the team accordingly	1	2	3	4	5

5. How important is coaching the proper technique to you for the following different phases of play?					
	Not at all important	**Not too important**	**Undecided**	**Somewhat important**	**Very important**
Scrum	1	2	3	4	5
Ball-carrying (Taking ball into contact)	1	2	3	4	5
Tackling	1	2	3	4	5
Line-out	1	2	3	4	5
Rucking	1	2	3	4	5
Maul	1	2	3	4	5
Catching and Passing (Ball Handling)	1	2	3	4	5
Falling to the ground	1	2	3	4	5

6. Coaches use various drills to train tackling and may spend more time on different aspects of the tackle. Please rate what method of coaching is important to you for a) Safety *(lowering the risk of getting injured during the tackle)* and b) Improving tackle performance *(preventing the ball-carrier from gaining territory and the ball-carriers team from retaining the ball)*

To indicate your answers make an X in the desired block

a) Safety	Not Familiar (NF)	Not at all important	Not too important	Undecided	Somewhat important	Very important
Live tackling in a 1 player vs. 1 player grid	NF	1	2	3	4	5
Using tackling bag	NF	1	2	3	4	5
Given verbal instruction	NF	1	2	3	4	5
Using shield	NF	1	2	3	4	5
Using body armour	NF	1	2	3	4	5
A full contact practice match	NF	1	2	3	4	5
Demonstration	NF	1	2	3	4	5
Tackling Drill combined with ball skill exercise	NF	1	2	3	4	5
Tackling Drill combined with a vision exercise	NF	1	2	3	4	5
Tackling Drill combined with reaction exercise	NF	1	2	3	4	5
Tackling Drill combined with fitness conditioning	NF	1	2	3	4	5
b) Improving Tackle Performance						
Live tackling in a 1 player vs. 1 player grid	NF	1	2	3	4	5
Using tackling bag	NF	1	2	3	4	5
Given verbal instruction	NF	1	2	3	4	5
Using shield	NF	1	2	3	4	5
Using body armour	NF	1	2	3	4	5
A full contact practice match	NF	1	2	3	4	5
Demonstration	NF	1	2	3	4	5
Tackling Drill combined with ball skill exercise	NF	1	2	3	4	5
Tackling Drill combined with a vision exercise	NF	1	2	3	4	5
Tackling Drill combined with reaction exercise	NF	1	2	3	4	5
Tackling Drill combined with fitness conditioning	NF	1	2	3	4	5

7. Techniques that reduce the risk of injury (safe techniques), can also improve performance?				
Not at all	**A little**	**A fair amount**	**Much**	**Very Much**

8. Techniques that improve performance, can also reduce the risk of injury?				
Not at all	**A little**	**A fair amount**	**Much**	**Very Much**

9. How much influence does the following have on your ability to currently coach technique for a) Safety *(lowering the risk of getting injured during the tackle)* and b) Improving tackle performance *(preventing the ball-carrier from gaining territory and the ball-carriers team from retaining the ball)*

To indicate your answers make an X in the desired block

a) Safety	**Not at all**	**A little**	**A fair amount**	**Much**	**Very Much**
Attending coaching courses on techniques for safety (including BokSmart & IRB courses)	1	2	3	4	5
Access to scientific information on technique	1	2	3	4	5
Training equipment (shields, tackle bags)	1	2	3	4	5
Communication to players	1	2	3	4	5
More time during training	1	2	3	4	5
Fully understanding the technical components of the skill	1	2	3	4	5
Access to coaching education and information resources (BokSmart DVD & website, IRB website)	1	2	3	4	5
Own experience	1	2	3	4	5
Other (Specify):					
b) Improving Performance	**Not at all**	**A little**	**A fair amount**	**Much**	**Very Much**
Attending coaching courses on techniques for improving performance (including BokSmart & IRB courses)	1	2	3	4	5
Access to scientific analysis of technique	1	2	3	4	5
Training equipment (shields, tackle bags)	1	2	3	4	5
Communication to players	1	2	3	4	5
More time during training	1	2	3	4	5
Fully understanding the technical components of the skill	1	2	3	4	5
Access to coaching education and information resources (BokSmart DVD & website, IRB website)	1	2	3	4	5
Own experience	1	2	3	4	5

10. If the latest scientific data showed a new, improved way to coach tackle technique for safety, would you implement it?				
Not at all	**A little**	**A fair amount**	**Much**	**Very Much**

11. If the latest scientific data showed a new, improved way to coach tackle technique to improve performance, would you implement it?				
Not at all	**A little**	**A fair amount**	**Much**	**Very Much**

12. What is your training plan for the next 4 weeks? Please indicate the session (S) in which each training component will occur within each week.													
	Week 1			Week 2			Week 3			Week 4			Comment
Aerobic/Cardio/Endurance conditioning	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Attacking Play	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Attacking Strategy	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Attacking strategy	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Backline plays	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Carrying the ball into contact	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Combining conditioning drills with contact skills training	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Contact Technique/Skills	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Cool down	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Decision making drills (2 v 1, 3 v 2, etc)	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Defensive Play	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Defensive Strategy	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Defensive strategy	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Falling after contact	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Kick-offs	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Lineouts	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Mauling	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Offloading in contact	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Position specific drills	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Rucking/Breakdown	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Scrumming	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Speed/Agility/Quickness/Reaction time	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Strategy	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Stretching	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Tackling	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Warm-up	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	
Wrestling/Static exertion exercises	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	

13. What do think is the risk of injury for the different phases of play?					
	Very Low Risk	**Low Risk**	**Undecided**	**High risk**	**Very High Risk**
Scrum	1	2	3	4	5
Ball-carrying (Taking ball into contact)	1	2	3	4	5
Tackling	1	2	3	4	5
Line-out	1	2	3	4	5
Rucking	1	2	3	4	5
Maul	1	2	3	4	5
Catching and Passing (Ball Handling)	1	2	3	4	5
Falling to the ground	1	2	3	4	5
Other (specify)	1	2	3	4	5

Additional Comment

Thank you for participating in this study!

Appendix B

Date:

- Indicate the answer with an X
- More than 1 answer can be given

1. Has tackle training occurred into today's training sessions?	
Yes	No
If Yes, continue below…	

2. Was the training specific to...	
Tackler	Ball-carrier (taking the ball into contact)

3. What was the coach's form of instruction to the players?		
Verbal + Demonstration	Verbal + No Demonstration	Other Specify_____

4. What was the layout of the tackle drill?				
Small grid (less than 10x10m) + controlled conditions	Small grid (less than 10x10m) + less controlled conditions	Large grid (more than 10x10m) + controlled conditions	Large grid (more than 10x10m) + less controlled conditions	Other Specify_____

5. What type of equipment?				
Shield	Tackling Bag	Body Armour	No equipment was used, live contact between players	Other Specify_____

6. What type of tackle (s) was performed during the training session?					
Front-on	Side-on	Smother	Behind	Double	Other Specify_____

7. Was emphasis given to any of the following?					
Performance/ outcome	Injury prevention	Technique	Safety	No particular emphasis was given	Other Specify_____ _____

8. Was the tackle drill combined with any of the following?					
Ball skill exercise	Vision exercise	Reaction exercise	Fitness exercise	No combination	Other Specify_____ _____

9. Number of tackle drills performed in this training sessions?
_____

10. Estimate the amount of total time spent on the tackle drill(s) (in minutes)?
_____minutes

Appendix C

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30/01/2014
☐ Not approved	See attached comments		
Signature Chairperson of the HREC		Date Signed	7/3/2013

Principal Investigator to complete the following:

1. Protocol information

Date form submitted			
HREC REF Number	525/2010	Current Ethics Approval was granted until	30 January 2013
Protocol title	Tackle Training Characteristics of Junior and senior rugby players		
Protocol number (if applicable)			
Principal Investigator	MARTIN SERCOMBE		
Department / Office Internal Mail Address	Department of Health and Rehabilitation Sciences; Division of Physiotherapy		

1.1 Does this protocol receive US Federal funding?	☐ Yes	☑ No
1.2 Has sponsorship of this study changed? If yes, please attach a revised summary of the budget.	☐ Yes	☑ No

2. List of documentation

RESEARCH ETHICS COMMITTEE
2013 -03- 07
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Appendix D

REFERENCE: 20110110-0010

ENQUIRIES: Dr A T Wyngaard

Mr Mogammat Sharief Hendricks
UCT/MRC
Research Unit for Exercise Science and Sports Medicine
Newlands

Dear Mr Mogammat Sharief Handricks

RESEARCH PROPOSAL: TACKLE TRAINING CHARACTERISTICS OF JUNIOR RUGBY PLAYERS

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Approval for projects should be confirmed by the District Director of the schools where the project will be conducted.
5. Educators' programmes are not to be interrupted.
6. The Study is to be conducted from **01 March 2012 till 22 September 2012**
7. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
8. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number.
9. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
10. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
11. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
12. The Department receives a copy of the completed report/dissertation/thesis addressed to:

The Director: Research Services
Western Cape Education Department
Private Bag X9114
CAPE TOWN
8000

We wish you success in your research.

Kind regards.

Signed: Audrey T Wyngaard

for: **HEAD: EDUCATION**
DATE: 21 February 2012

Appendix E

Ethics in Health Research: Principles, Structures and Processes 2004, Department of Health

Research Involving Deception of Participants, Concealment or Covert Observation (page 46)

As a general principle, deception of identifiable participants, concealment of the purposes of research or covert observation are not considered ethical because they are contrary to the principle of respect for persons and the obtaining of informed consent. In studies of human behaviour there may be exceptional circumstances when studies cannot be conducted without deception, concealment or covert observation of participants. Before approving a research proposal that involves any degree of deception, concealment or covert observation, a research ethics committee must be satisfied that:

- The provision of detailed information to prospective participants about the purpose, methods and procedures of the research would compromise the scientific validity of that research; ☑
- The precise extent of deception, concealment or covert observation is defined; ☑
- There are no suitable alternative methods, not involving deception, concealment or covert observation, by which the desired information can be obtained; ☑
- Participants are not exposed to an increased risk of harm as a result of the deception, concealment or covert observation; ☑
- Adequate and prompt disclosure will be made and de-briefing provided to each participant as soon as practicable after the participant's participation is completed; ☑
- Participants will have the opportunity to withdraw data that were obtained from them during the research without their knowledge or consent; ☑ and
- Such activities will not corrupt the relationship between researchers and research in general, with the community at large. ☑

Lesley Henley, IRENSA July 2009