

CONTACT CONDITIONING – THE KEY TO INJURY PREVENTION BY NICK TATALIAS.

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Presently he is working in conjunction with Philip Copeman on a project called "Iron Rugby", which attempts to bring the best practices from American Football into Rugby Union. The rudiments of this project can be found at the following website:

http://www.box.co.za/wiki/index.php/Iron_Rugby

Introduction.

Following the recent press coverage of Matt Hampson's tragic spinal injury in the UK and the death of a schoolboy in South Africa, the contact nature of rugby and the potential for injury is once again in the spotlight.

Recent articles in the media have had people calling for the banning of the contested scrum. The contested scrum is a significant and important part of the game of rugby union and purists and fans alike don't want to lose this facet of the game - but the image of rugby union and the health of players must also be considered.

I do believe that law changes to the scrum phases, particularly at the junior level of the game, need to be looked at closely so that any changes made are effective at reducing injuries. However, the solution lies not in removing the contest of the scrum, but in improved player conditioning.

Causes of Injury.

In a web-based discussion group on Yahoo, (started by the late Mel Siff, Ph.D., author of the book ‘Supertraining’) on the Supertraining Forum, Jamie Carruthers, one of the moderators of the forum, posted a number of rugby-injury-related research papers regarding injury potential. I refer to some of these in this article.

I have extracted the following snippets from these research papers: In South Africa, the number of spinal injuries from non-scrum-related contact was actually higher than scrum injuries [i] The number of injuries caused by non-scrum-related injuries has overtaken the scrum-related injuries. The tackle phase and dive tackles were quoted as being the greatest contributors to traumatic spinal injuries. However, in the UK the scrum still remained a bigger cause of injury.

Embarrassingly, in South African rugby, illegal high tackles account for a significant number of serious injuries [ii] Strict enforcement of the “dangerous tackle above the shoulder” law should be implemented and red cards and mandatory suspensions for these law-breakers should be the norm.

Ken Quarrie from Sportsci.org, in discussing recently published data, noted that serious spinal injury occurred more often at the beginning of the season than the end because players were not contact-ready, largely because impact was not practised prior to the season and (most importantly for me) that players were not trained or conditioned for impact [iii]

In a striking comment regarding rugby injuries, Ken Quarrie said of lack of impact conditioning, “Players often perform aerobic, anaerobic, speed, strength and power training over the off-season. Conditioning the body to cope with the impacts that are a major part of rugby is ignored by the majority of players” [iii].

I would like to extend Ken’s arguments. I believe that specialist contact conditioning should be carried out in season as well as out of season. One of the research papers that was cited by Jamie Carruthers stated that runners tackled from behind who were unable to see the tackler coming and were thus unsighted or “blind-sided” in tackles, were susceptible to injury [iv]. Tacklers were more susceptible to injury in head-on tackles[v] and the injury mechanism was often due to the rotation of the neck when the neck was in flexion [ii]. Lastly, and perhaps most importantly, injury in the tackle was 80% more likely to happen to the player who had the least momentum or speed whilst entering the contact situation [iv].

The solution.

To my mind the solution to a number of these problems is fairly simple. By teaching players to use proper biomechanics in the tackle phase, the number of injuries and their severity could be reduced. To prevent the flexion-rotation injury, players should keep their heads up in contact. In other words, have their necks in the extension position. Furthermore, the building of good strong neck muscles with plenty of raw strength and strength endurance must help reduce the chance of injury, particularly injury by whiplash.

Teaching players to be *offensive* defenders as opposed to waiting for the offensive player to make contact, will also reduce the tackler’s chance of injury as he will be entering the collision with similar, if not higher, momentum than the opposition player.

This more aggressive defensive mindset also aids the defender, as it quickly reduces the ball-carrier’s options, increasing the pressure to make his decision much sooner, disrupting the offensive rhythm and catching the opposing player in two minds.

Using the metaphor of the bow and arrow to teach player the fundamentals of contact can be quite useful. The analogy uses the bow to represent the explosive strength of the legs. The tightly strung bow string represents the hips and mid section of the player stiffening on contact and the straight arrow represents the upper body which should be held in a neutral spine position (perhaps a slightly over arched lordotic curve) on impact. The player should imagine a strong upper torso with good posture shooting into the opponent. The metaphor also helps the player to realize the importance of strong, powerful legs and the tensioning of the lower torso to really elevate the explosion on contact while the upper body is required to transfer these forces to the opposition player.

Good contact conditioning, together with power conditioning *throughout* the season will help to reduce the number of injuries.

Action Points.

From what I have seen here in South Africa, in terms of schoolboy, club and even provincial and international-level rugby, I believe the following comments apply:

1. **Player strength conditioning should improve.** The level of conditioning of the players is well below what it should be, especially conditioning of neck muscles. Overall, strength explosiveness and quickness is below par and bigger players are often weak relative to their size. Better testing of players' strengths and weaknesses should be considered and coaches should take this phase of preparation much more seriously.
2. **Improve contact training.** The contact phase of the game is misunderstood, badly coached and generally assumed. Coaches seem to generally assume that letting players dive into and knock over tackle bags, run into players holding shields and falling to the ground, represents contact conditioning. The reality is that poor body mechanics in contact can be seen at all levels of the game and the drills used to teach this aspect of the game often entrench poor form.

3. Poor tackling form can be improved. Even at top level international rugby, I see players making tackles and entering contact in rucks and mauls with their heads down, which has the effect of rounding the spine, mostly the cervical and the upper thoracic regions of the spine. This allows the shoulders to slump and limits the amount of support for stiffening the spine that powerful muscle like the latissimus dorsi and rhomboids can contribute. The dropped head also has the knock-on effect of a poorly rounded lumbar region of the spine. These poor contact positions will result in injury.

Even if there is no immediate noticeable injury, repetitive trauma to the back will result in back-related problems in later life. This is borne out by an injury study that showed significantly higher osteoarthritis and other degenerative diseases in rugby and previous rugby playing subjects when compared to a non-rugby playing control group[vi]. Furthermore, the ridiculous aspect of this type of tackle is that, apart from the tackle being dangerous to the tackler, it is also hopelessly ineffective.

When tackling with the head down, the tackler limits his vision of the opponent and can not make last-second adjustments to the runner's changes of direction. This will cause players to miss the tackle entirely or simply bounce off tackles.

When the tackler's head is down the shoulder position of the tackler severely limits the range of movement of the arms, which means that the tackler is attempting to grasp and hold his opponent in an anatomically weak position. This again causes the tackler to fall off the tackle or, worse, injure his shoulder or, most seriously, injure the spine.

If there is impact on the tackler's head in this head-down position, then the chance of the head being pushed into a flexion rotation injury (a significant cause of traumatic spinal damage) is much higher.

The pain experienced by the tackler (even if no injury occurs) from contact in this poor postural position then leads to a reluctance to tackle, which slows the player into contact and causes the player to flinch in contact. Flinching prior to the tackle leads to a poor

body posture by the tackler which can lead to injury. The reluctance to tackle also results in the player reducing the speed of entry into the tackle, which in turn increases the chance of injury – a self fulfilling closed loop.

The simplicity of the cure is what really makes the frequency of this poor tackle form so outrageous. The solution is simply to *lift the head*. This gives better vision, posture, arm leverage and, therefore, strength, improved impact strength and control of the opposition player in the tackle. As an option in practice, players should be reintroduced to contact using specialised helmets and pads as used by American Football players. As players become accustomed to contact with proper form and lose the fear of contact, then contact without helmets and pads is introduced. The intensity of the contact can then be increased until game speed (or faster) tackles are being made during practice with good form.

4. **Improve scrum methods.** Improved methods of engaging in the scrum can be utilised. I refer to an article entitled ‘Total Impact Method: A Variation on Engagement Technique in the Rugby Scrum’ that can be found at <http://www.coachesinfo.com/category/rugby/84/> as an example of the right kind of thought being put into biomechanics to improve performance and safety. In this style of engagement the front row player starts from a position of forward lean and he is held back by his lock. This forward lean puts the player in a position of power and ensures that the player’s hips, legs and lower back will be in a good posture at the point of impact.

A further example of good posture leading to success is the Argentinean Bajada scrum. Technique of the Bajada focuses on all players having their heads up and being able to see the ball. They are taught to inhale and draw the scrum tightly together before pushing. This will have the effect of stiffening each player’s mid section (indrawn breath) and upper back (pulling the scrum together). This creates a powerful and correctly shaped upper torso that will readily transfer each player’s leg drive to the opponents’ scrum and improve back posture for reduced injury.

The Argentinean locks don't bind through the legs of the prop but around the prop's hips. This, apart from enabling the locks to pull the scrum tightly together, also helps the prop. The problem with the bind through the legs is that the lock then pulls the prop's shirt down and rearwards. This will in turn pull the prop's shoulders down and make it more difficult for the prop to get his back into a neutral spine position (back extension). With shoulders pulled lower, the prop's upper back muscles (latissimus dorsi and romboids) are stretched and less able to activate in tightening and protecting the thoracic spine. This downward and rearward shirt pull may be contributing to poor shoulder and spinal posture, especially in the more junior levels of the game. Is it time to re evaluate 'how we've always done it'?

5. Institute strength testing. Improved strength, power and biomechanics of the contact phase of the game that have been designed for improved contact conditioning will go a long way toward improving the safety of players. Institute strength testing for players and set the rests at certain minimum levels for different levels of competitions. Strength testing of front-row players on a regular basis is essential and should be adopted as a matter of importance. These tests should be both of a raw-strength nature and a strength-endurance nature. Strength testing for all other players should also be adopted

6. Sport-specific contact conditioning. Training for strength and strength-endurance as well as power and explosiveness using basic barbell sets supplemented with sport-specific strength training equipment like the ScrumTruck® [vii] (see notes at end) will improve player performance. Sports-specific training in contact-conditioning provides players with proper tackling technique that converts the power and explosiveness and strength qualities generated in the gym into real on-field explosion.

7. Improve coaching standards. Improved training of coaches to understand these fundamentals may help. If my rugby-playing career was anything to go by, then coaching standards need improving. I was never taught even some pretty fundamental principles of contact conditioning, biomechanics, economy of motion or even something as simple as

running backwards. These things were simply never taught because the coaches themselves never knew.

Running backwards may seem like an odd skill for rugby players, but the lack of this skill, due to lack of coaching, nearly cost the Springboks a Tri-Nations series and it did cost them the game. An example of not understanding running backwards happened during South Africa's 2004 Tri-Nations winning campaign. During the game Australia scored a first-half try by kicking a high ball to the corner. Percy Montgomery, who was in perfect position to cover the kick, was out-jumped for the ball because he had run backwards to get into position and was unable to change direction quickly and explosively enough because he was off balance. The opposition recovered the ball and the second player was unable to tackle the catcher because he was also wrong-footed. The result was a try that kept Australia in the game and enabled a last-minute try by Clyde Rathbone to win the match for Australia. (I'm not trying to pick on any particular player here - Percy is the consummate professional - but to cite a typical example.) These issues are simple to teach but it seems that coaches are blissfully unaware of the issues. It was only when I had to change codes to play on the gridiron that I even became aware of some of these issues.

8. Re-evaluate substitution laws. Re-evaluation of the substitution laws is required. I believe that laws should allow more substitution of front row players in order to prevent fatigued players from having to engage in the scrum, as the possibility of slipping and scrum collapse is increased with increasing player fatigue.

9. Use better training aids. As an aid to coaches, there is a need for training equipment that helps teach players to lose their fear of contact, improve their contact biomechanics and toughen and harden players for the contact phase of the game with reduced risk of injury. The use of moving tackle bags that run on rails improves contact readiness without increasing injury risk. Using tackling sleds that provide better tackling resistance must be used. Using American football pads and helmets in practice allows a player to tackle hard with reduced risk of injury and increased use of good form. These tools exist

and are in use and should be used as part of the build-up to the season and for continued contact conditioning during the season.

The following photographs show exactly why I needed to write this article and highlights why serious spinal trauma injuries are so possible in rugby. Even the best conditioned bodies will not withstand this sort of battering for long.



This photograph shows two international players from a game between France and South Africa. Look at the tackling posture of the French player. His head is down, which will increase the possibility of a serious neck twist and flexion injury. His spine (red line) position during impact will encourage some sort of micro trauma to the spinal column. Not only is his back rounded (in flexion) in the lumbar and thoracic areas, it is also twisted sideways. If he were to straighten his back to form the arrow (green arrow) shooting from the bow of his legs and hips then lift his head and drive hard into the tackle, the likely outcome would be a safer and far stronger contact. The tackle would drive John Smit backwards and would be very different from what we see.

John Smit, the ball carrier, is also running way too upright, which means that when this poor tackle makes contact, Smit will more easily be brought to ground rather than breaking the tackle. John's head is up (very good) but his spine is in flexion in the lumbar and lower thoracic areas (red dashed line). He needs to be bending at the hip with increased mobility of the hip and strength from the gluteals to improve his contact position.

The following photograph is from the RFU website and I would suggest that it shows children being taught incorrect technique in the tackle. The teaching of impact needs to be taught properly from an early age and it might be that coaching techniques need to be re-evaluated at all levels of the game. Fundamental errors should not be made in such an important skill as the tackle.



All in all, it is an example of how *not* to play rugby in the contact phase and yet this sort of action picture permeates the media as an example to our children and younger players. Even at the highest level (1st photograph, South Africa v France) there is glaring photographic evidence of poor (and dangerous) technique.

References

- [i] British Journal of Sports Med 1991 Mar;25(1):57-60: Catastrophic Rugby Injuries of the Spinal Cord: Changing Patterns of Injury. Scher AT.
- [ii] South African Medical Journal 1991 May 18;79(10):614-5 Paralysis due to the high tackle--a black spot in South African rugby: Scher AT.

[iii] “The proportion of all rugby injuries that occur early in the season is high (Alsop et al., 2000). The pattern of spinal injuries has been shown to follow a similar pattern (data from Armour et al., 1997; Palairret and Xiong, unpublished, 2000)”

[iv] Garraway WM; Lee AJ; Macleod DA; Telfer JW; Deary IJ; Murray GD: Factors Influencing Tackle Injuries in Rugby Union Football Br J Sports Med, 1999 Feb, 33:1, 37-41

[v] J Sci Med Sport 1999 Jun; 2(2):153-62:The Nature and Circumstances of Tackle Injuries in Rugby Union. Wilson BD, Quarrie KL, Milburn PD, Chalmers DJ

[vi] S Afr Med J 1990 Jun 2;77(11):557-8 Premature onset of degenerative disease of the cervical spine in rugby players.Scher AT.Dept of Radiology, University of Stellenbosch, S Africa

[vii] This equipment can be found at www.myoquip.com.au and represents a giant step towards rugby sport-specific equipment.