**Prevention of Hamstring strains in Rugby by warming up or stretching   
*a systematic review***

***Sven van Nieuwenhuizen-20045781  
Bas Leupen-10022279***

**Abstract**

In rugby 59.2% of all injuries are strains and sprains. The most common strain is the hamstring strain. It is generally believed that warming up and stretching are the key elements to preventing these injuries. What is the scientific opinion on these statements, and what is the best way to prevent the hamstring strain? This article systematically reviews epidemiological studies on rugby injuries from 1999 to 2011 in which a hamstring injury was included. Results show that warming-up is a good way to start any workout. If this workout would be a sport activity, like a game of rugby, the best warming up is said to have a duration of 15 minutes on 60 percent of your VO2 Max.  
Stretching can best be done right after the workout or at night before retiring. Pre-workout stretching is not advised as it reduces the quality of the required movement.

**Introduction**Rugby is well known for a high injury rate. Orchard and Seward (2003) have been conducting annual injury surveillances in the Australian Football League (AFL) over the past 11 years. They reported the 11 year average of the most common injuries, and compared injury rates between senior and junior Australian football players (Orchard et al., 2005) (Figure1).

Lower limb muscle strain injuries (particularly hamstrings) are very common and prevalent in the AFL competition and are potentially preventable (Orchard et al.,2005).

The leading cause of injury that has been specifically identified is ‘being tackled’. The ball carrier is twice as likely to be injured compared with the tackler. Overexertion is the second most common identified cause of injury, accounting for 8.1% of all injuries. Overexertion is the most common of the “non contact” injury events. Hamstring strains in rugby are mostly caused by overexertion. Overexertion accounts for at least 60% of all hamstring strains in rugby (35% occurred in events unknown) (Orchard et al.,1998).

Thorough documentation throughout the years has proven that this injury is the most reoccurring one. It also causes the most hours of missed play (Orchard et al., 2005) (Figure 1).

Furthermore, it requires more insight in how this injury with great impact on the sport can be prevented or minimalized. Can players prevent Hamstring strains in Rugby by performing warming ups or stretching?

The goal of this study is finding a reliable methods on how to prevent the hamstring injury in rugby players. This research also strives to make trainers and players more conscious about their mental and physical health.

The concept of this study is to contribute to injury prevention in rugby sport activities.

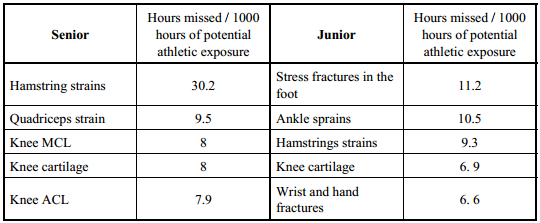
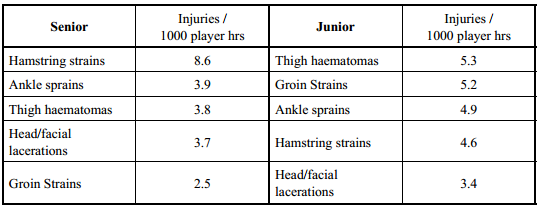


Figure 1 Reported top five most common injuries.(Orchard et al 2005)

**Materials & Method**

For this article, information on rugby injuries has been explored. What are the most common injuries, and how do they occur? Also, information about stretching and warming up has been searched. What are the general views about these issues, and what are the scientific views?

One of the used sources for this article is the internet library of The Hague University. In this library the option of ‘Simultane Search’ has been used. The language is mostly set to English, and an occasional search has been done in Dutch. The search terms in English which were used are; stretching, warming-up, warming-up during sports, hamstring injuries, rugby injuries, strains, rugby. In Dutch we combined the search terms; Rekken (stretching), blessures (injuries) and blessurepreventie (injury prevention). The first twenty results found in the selection “all results” have been examined and filtered on relevance to this research.

Another search source that is used is ‘Google Scholar’. In Google Scholar the search terms which were used are; rugby, rugby preventions and rugby injuries. Again the results for the first 20 articles were analyzed for this article.

A selection of the studies that were found was made on relevance to the prevention of hamstring injuries in rugby. 12 relevant articles were found for this study. This article was written by combining these articles all of which can be found in the References section. In this article both the similarities and contraries will be described. A discussion and conclusion will then describe a summary of all views.

***Results***

Many studies since the 80’s and 90’s show that stretching can have a positive effect on injury prevention and athletic performance. New studies show that stretching is not always beneficial to injury prevention in every sport (Witvrouw, 2006). In this study different sports are categorized. The categories that are made are defined in the amount of intensity of stretch and shortening movements. The main issue is the level of /degree in interchange in lengthening and shortening of the different muscle groups.

During sports that involve high-stretch and shortening movements, muscles need to be strong enough to absorb and process the high impact energy. “When athletes do not have the capacity to absorb this energy, they will have an increased injury risk”. This study describes recent stretching programs that can influence the viscosity of the tendon. These stretching programs result in greater muscle elasticity, and therefore a greater injury prevention.

Stretching could play an important role in the prevention of injuries in sports with intensive stretch-shortening cycle movements.

It is suspected that stretching does not prevent injuries in sports with no or low stretch-shortening movements.

The intensive stretch shortening movement sports are categorized into four different sports: football, volleyball, tennis and rugby. The “no or low stretch shortening movements cover jogging and cycling. In the intensive stretch shortening movements, a high muscle-tendon capacity is required. This can be achieved by stretching the muscles.

The study of Porntratshanee (2004) confirms several of the explanations described in by Witvrouw (2006). There, it is explained how in different sports different capacities are indeed required by the muscles.

Stretching should not be necessary in certain sports, because the Range of Motion in this sport does not require the amount of stretch by the muscle during the sport. This would only result in a decreased quality of movement. When it comes to intensive stretch shortening movements both studies state that stretch exercises are beneficial.

But when should these muscles be stretched? Before or after the physical activity?

The study of Mark S. Kovacs (2006) stated that pre-exercise static stretching does not prevent injuries. The research consisted of a study on pre-exercise stretching on over 1,500 men over a period of 12 weeks (Pope et al., 2000). This study showed that pre-stretching does not have an effect on injury prevention. After this research five different researches were done and a systematic review on these experiments by Yeung (2001) confirms that Pre-exercise stretching does not prevent injuries.

The Study of Kundson (1999) states that the best moment of stretching is after training, after a competition, or in the evening (post stretching). This can reduce the chance of injury and keep the muscle strength optimal; “A better time for athletes to perform static stretching is after sports activities or in the evening. (Kovacs, 2006). These studies conclude that in sports that consist of intensive stretch shortening movements, like rugby, pre-stretching exercises are not advices. The advice is to perform stretching exercises the night before and the night after the sports activities.

It is assumed that the warming-up for a workout or competition is a good exercise.

A study by Cone (2007), discussed the effects of a warming-up in football, hockey and lacrosse. The research shows that a warming up has been proven positive for multiple reasons. It is a mental preparation for training or competition, it both works as an injury prevention and enhances the physical performance.

The warming up activates the musculoskeletal system. The O2 uptake, muscle temperature and the heart rate are all increased. All these factors ensure that the body is prepared for the training or the upcoming match. For an intensive sport it is stated that a warm-up for 15 minutes at an intensity of 60 percent of your VO2 max is the best way to activate the factors stated above.

**Discussion**

This study combines multiple studies on sports injuries and the prevention thereof. The goal of this study is finding a reliable methods on how to prevent the hamstring injury in rugby players.

So far, no common best way of practice is available to prevent sports injury in rugby. The studies that were used as literature, showed many different methods and advises. This is perhaps not surprising as every rugby player is different.

The studies have been performed over a period of almost two decades. During that time, many new views have been developed and with that the methods and advises.

Porntratshanee (2004) and Witvrouw (2004) show a difference in sports on if it is beneficial to stretch. In this article rugby is classified as a sports with intensive stretch-shortening cycle movements. On this category both studies conclude that stretching can be beneficial. These studies don’t show when to stretch.

Studies from the 80’s and 90’s often conclude stretching before an exercise (pre-stretching) can be beneficial. More recent studies of Kovaks (2006), Pope (2000) and Yeung(2001) show a contradictive result with more outdated studies that pre-exercise stretching does not have an effect on injury prevention. No cause of these contradictive results has been found. More recent technology could be a cause of these contradictive results. In this study the more recent studies have been accepted as more reliable.

Kundson (1999) and (Kovacs, 2006) stated that instead of stretching before an exercise, stretching after exercise(post-stretching) is beneficial to preventing injuries. No contradictions on these findings have been found and will be considered as a reliable method on preventing a hamstring strain in any sport including rugby.

Furthermore for the research on warming up by Cone (2007) a warming up was found to be beneficial to injury prevention. Rugby is assumed to be in the same category as the sports that were researched by Cone (2007)

No contradictive studies were found and the method described by Cone (2007) will also be considered as a reliable method on preventing a hamstring strain in any sport including rugby.

Findings and conclusions are based on the average rugby player. All players have their own characteristics. Therefore every player has different needs for his body. The method of Cone (2007) states a warming up time of 15 minutes at 60 percent of your VO2 max is the most efficient. But this can be different for each player.

Several different relevant methods on how to prevent a hamstring injury in rugby have been found. To create one reliable method on how to prevent the hamstring injury in rugby players, these findings will be combined for this study.

For this research no funding was available, therefor several articles that were found have not been added to this research. Only articles that were free of charge have been used for this research.

Articles that are found can sometimes be contradictive. In this research it was tried to find the most reliable and useful articles to make a conclusion on the prevention of the hamstring injury. Hereby the named outdated studies have not been added in this research. Nevertheless, when doing research on the human body it is always hard to find one true answer.

The conclusions that have been made are all based on literature. To corroborate these conclusions a research should be conducted with several groups of rugby players. To research whether a warming up contributes to the prevention of hamstring injuries, the research should be conducted with a group of athletes that that do a warm up and a control group that don’t do one. Also further research should be done on whether stretching contributes to the prevention of hamstring injuries. This can be executed by researching a control group that does not do any stretching exercises, a group that does pre-stretching exercises and a group that does post-stretching exercises like concluded above. This research should be done over a longer period of time. The duration of this research can be determined during the research. We recommend at least a research time of 1 year.

**Conclusion**

Can players prevent Hamstring strains in Rugby by performing warming ups or stretching?

It appears that in rugby there is a big chance one will get a hamstring strain.

From this systematic review, one can conclude that with the right approach the probability of a hamstring strain can be reduced. 1) A warming-up is a good exercise for a match or training and works injury preventive. A warming-up is not only a good physical preparation but also mentally. A warming up time of 15 minutes at 60 percent of your VO2 max is the most efficient. 2) A post workout stretch exercise and stretching at night are said to be injury preventive. 3) A pre workout stretching exercise is not recommended since it does not work as an injury prevention. Furthermore pre-stretching can cause an unnecessary increase in range of motion and can reduce the quality of movement and the physical performance that is needed. This can be considered as a disadvantage during a rugby game. Further study should be done to confirm these findings.

**References:**

[Goldman, Elliott F](http://easy.squareis.com/http/search.proquest.com/assia/indexinglinkhandler/sng/au/Goldman,+Elliott+F/$N?accountid=27407&____x=1366), [Jones, Diana E](http://easy.squareis.com/http/search.proquest.com/assia/indexinglinkhandler/sng/au/Jones,+Diana+E/$N?accountid=27407&____x=1366). [Physiotherapy](http://easy.squareis.com/http/search.proquest.com/assia/pubidlinkhandler/sng/pubtitle/Physiotherapy/$N?accountid=27407&____x=1366)[[http://easy.squareis.com/http/search.proquest.com/assets/r20131.3.3-2/core/spacer.gif?____x=1366&____g=img&____i=0](http://easy.squareis.com/http/search.proquest.com/assia/indexingvolumeissuelinkhandler/24071/Physiotherapy/02011Y06Y01$23Jun+2011$3b++Vol.+97+$282$29/97/2?accountid=27407&____x=1366)97.2[http://easy.squareis.com/http/search.proquest.com/assets/r20131.3.3-2/core/spacer.gif?____x=1366&____g=img&____i=0](http://easy.squareis.com/http/search.proquest.com/assia/indexingvolumeissuelinkhandler/24071/Physiotherapy/02011Y06Y01$23Jun+2011$3b++Vol.+97+$282$29/97/2?accountid=27407&____x=1366)](http://easy.squareis.com/http/search.proquest.com/assia/indexingvolumeissuelinkhandler/24071/Physiotherapy/02011Y06Y01$23Jun+2011$3b++Vol.+97+$282$29/97/2?accountid=27407&____x=1366)  2011: 91-99.

Interventions for preventing hamstring injuries: a systematic review

John R.Cone,MS,CSCS, Cone Fitne5sTraining & Consulting LLC,Chapel Hill, North Carolin.2007 Warming Up for Intermittent Endurance Sports.

Knudson D, Stretching during warm-up: do we have enough evidence?

JPhys Educ Recreation Dance. 1999:70(7):24-27,

Mark S. Kovacs, Med, CSCS, USATF II University of Alabama, Tuscaloosa, 2006

The Argument Against Static Stretching Before Sport and Physical Activity

Orchard, J. and Seward, H. (2003) AFL Injury report 2002

Orchard, J. and Seward, H. (2005) AFL Injury report 2002-2004

Orchard, J., Wood, T., Seward, H., & Broad, A. (1998). Comparison of injuries in Elite Senior and Junior Australian Football. Journal of science and medicine in sport, 1, 2; 82-88

Porntratshanee Weerapong, Patria A. Hume and Gregory S. Kolt 2004, Stretching: Mechanisms and benefits for sport performance and injury prevention.

Pope RP, Herbert RD, Kirwan JD, Graham BJ, A randomized trial of

pre exercise stretching for prevention of lower-limb injury. Med Sci

Sports Exerc. 2000:32(2):271-277.

RUISS presentation, Research of Injury Risks in Rugby Union

Erik Witvrouw, Nele Mahieu, Lieven Danneels,Peter McNai, 2006, Stretching en blessurepreventie – een eigenaardige verhouding.

Yeung EW, Yeung SS. A systematic review of interventions to prevent lower

limb soft tissue running injuries. BrJ Sports Med. 2001:35(6):383-389.