Preventing the seemingly unpreventable – challenging the return-to-play criteria for recurrent hamstring strain prevention

N Craddock , BSc (Physiotherapy), **K Buchholtz,** MPhil (Sports Physiotherapy)

Division of Physiotherapy, Department of Health and Rehabilitation Sciences, University of Cape Town, Old Main Building, Groote Schuur Hospital, Anzio Road, Observatory, Cape Town, South Africa

Corresponding author: *N Craddock (CRDNIC004@myuct.ac.za)*

Background: Hamstring strains are one of the most common injuries in sport. Previous injury has been found to be one of the greatest risk factors associated with recurrent hamstring strains. Although rehabilitation programmes have been developed and implemented to aid safe and efficient return-to-play, the incidence of hamstring injuries has not decreased.

Discussion: As hamstring strains most commonly occur during the eccentric phase of muscle action, rehabilitation should focus on eccentric muscle strengthening. The L-protocol and the Nordic Hamstring Exercise protocol strengthen the hamstring muscles eccentrically. They have been found to be effective in decreasing the incidence of new hamstring strains as well as the rate of recurrence. This commentary therefore aims to suggest changes to the return-to-play criteria following hamstring strains to prevent the seemingly unpreventable.

Keywords*:* hamstrings, injury prevention, sports, eccentric movement

S Afr J Sports Med 2017; 30:1-2.DOI: 10.17159/2078-516X/2018/v30i1a3401

Hamstring strains are one of the most common injuries in sport, [1] particularly in field sports such as soccer. [2] Despite ongoing research within injury prevention and management of this condition, there is an increasingly high rate of recurrence of hamstring strains. [1] Some of the questions that need to be considered are: Is this due to ineffective or incomplete rehabilitation? Or is it due to inadequate return-to-play guidelines?

A hamstring strain has two main mechanisms of injury. The first mechanism of injury occurs following a forceful eccentric contraction at a high speed, during the late swing phase of the running gait cycle. The second mechanism of injury occurs when the hamstring muscle is stretched beyond its available range of motion or load tolerance. [1,3] Besides hamstring strains being classified according to the mechanism of injury, they can also be classified into three different grades, depending on the degree of severity of the injury. This gives practitioners information regarding the size of the tear, the amount of pain and potential loss of function. [1,3] Additionally, they may be described based on the location in the specific hamstring muscle affected. [2]

Discussion

While studies thus far have proposed various return-to-play criteria following hamstring strains, the validity and reliability of these criteria have not been established. Careful consideration of the current literature [1,2,6] has suggested the best return-to-play criteria for athletes post hamstring strains as follows: on examination of the injured player there should be no pain on local palpation or during strength testing, with a maximum of ten percent difference in strength between the injured and uninjured limb. Active and passive hamstring flexibility should demonstrate a less than ten percent difference in range between the injured and uninjured side. There should be no pain during functional performance (such as sports-related movements to near maximum intensity/speed compared to pre-injury level) and no pain post functional testing. On-field testing should include repeated sprint ability tests, deceleration drills and single-leg bridging, depending on the specifics of the sport. [1,6] Longer return-to-play times have been associated with increased pain on the initial examination, increased pain and weakness during mid- and outer-range strength testing, delayed start to rehabilitation, and pain with single-leg bridging. [2]

It is important to first identify the potential risk factors for sustaining a hamstring strain. The literature states that the greatest risk factor for a hamstring strain is a previous hamstring strain. [1,3] The high rate of recurrence could be due to ineffective rehabilitation programmes, returning to sport too soon, or a combination of these and various other modifiable and non-modifiable risk factors. These include increased age, decreased flexibility, muscle imbalances and fatigue. [1,3] Thus players are sustaining recurrent hamstring strains despite following rehabilitation protocols. Time-loss injuries are burdensome to athletes, their teammates and sporting coaches, with an average of 17 days lost to injury in rugby and 18 days lost to injury in soccer. [3] The psychological impact of sustaining an injury may drive athletes to return-to-play too quickly, in combination with perceived pressure from the team and staff, further increasing their risk of sustaining another injury.

The risk factors discussed above are only a few of those that have been identified exhaustively in the literature. Many other risk factors have been suggested but with less evidence to support their role in predisposing athletes to hamstring strains. These include poor lumbopelvic control/stability, inadequate warm-up, changes in muscle fibre composition following injury, an increased training volume or level of participation, neural tension and race. [1] Despite the effort of rehabilitation programmes to address these risk factors, the rate of recurrent hamstring strains is still high (22%), particularly in the first two months following injury. [4]

Two protocols have been developed that have been shown to be effective in reducing the rate of new hamstring strains, as well as the rate of recurrence. These include the L-protocol and the Nordic Hamstring Exercise protocol. The L-protocol, developed by Askling et al. [4] consists of three exercises, namely, the Extender, the Diver and the Glider. The aim of this protocol is to strengthen the hamstring muscles in a lengthened position and on contraction during lengthening (eccentric

muscle action). In a study conducted on elite football players, the L-protocol was found to significantly decrease the return-to-play time in comparison to standard rehabilitation programmes, as well as reduce the rate of reinjury. [4] Mechanistically this protocol makes sense, as the two mechanisms of injury occur whilst the hamstring is in a lengthened position and therefore under most tension. This is clearly the weakest point in the range and therefore exercises need to focus on strengthening the hamstrings in this outer-range to prevent injury. This protocol is easy to implement in practice and shows promise in terms of efficacy, and it may therefore be highly beneficial in terms of return-to-play criteria.

The Nordic Hamstring Exercise [5] has been implemented in various sporting populations worldwide. This single exercise protocol, which involves a controlled lowering of the trunk to the floor from a kneeling position, increases the eccentric strength of the hamstring muscle and thereby improving its ability to tolerate high loads while placed under stress. [5] In a study conducted by Peterson et al. the Nordic Hamstring Exercise has been shown to be effective in reducing the rate of overall, new and recurrent hamstring strains in both amateur and professional soccer players. [5] As the injury recurrence rate is high, and a previous injury is a risk factor for recurrent injury, preventative strategies are extremely important. While this exercise may be more difficult to implement in the non-athletic population due to its relative degree of difficulty, it is likely to be an essential exercise in the athletic population due to the high demands placed on the body during competitive sport. No equipment is needed and it can be performed in pairs, making it a great team building exercise.

The successful completion of the L-protocol or the Nordic Hamstring protocol should be included to the return-to-play criteria as evidence shows that these protocols significantly reduce the risk of reinjury. The average return-to-play time following correct execution of the L-protocol is 28 days this protocol should potentially be performed for a minimum of four weeks to be considered successful in its application. [4] The Nordic Hamstring protocol has been found to be effective when performed for a minimum of five weeks (known as the build-up phase) and continued for a further five weeks [5]. Implementing one of these protocols will provide clinicians with stronger outcome measures. However, successful completion of either protocol should be reviewed in conjunction with the clinically based return-to-play criteria. This is also important for physiotherapists to use their clinical reasoning skills to determine if a player is 'fit' to return-to-play.

As evidence-based practitioners, it is necessary to provide the most up–to-date information, treatment and rehabilitation to patients and athletes. Clinicians should not forget the psychological effects of an injury on a player and the setbacks that this may have on their confidence and performance. Psychological readiness should be another key criterion for return-to-play. Anxiety about reinjury may lead to fear avoidance or altered patterns of behaviour, thus it is essential that the player is deemed both psychologically as well as physically fit to return-to-play. [6]

Rehabilitation is a holistic approach. It is important that all aspects of rehabilitation are covered in order to return the player to his/her optimal level of functioning. If an athlete is returned to play too soon their risk of reinjury increases, especially in the first two months of competition and training when they are most vulnerable. Delayed rehabilitation may paradoxically also be a risk factor. Early mobilisation and rehabilitation within safe limits should be prioritised, whilst ensuring that the rehabilitation programmes are completed in full. A conscientious decision must be made solely with the best interest of the player in mind despite pressures from outside forces, such as coaches, team managers and the media. Further research is recommended to determine whether these rehabilitation protocols are being implemented correctly, whether players are complying with the full rehabilitation protocols, and if graduated sport-specific return-to-play programmes are being undertaken.

Conclusion

Failure of the hamstring muscles occurs regularly during the eccentric phase of the gait cycle in running or muscle contraction; therefore the focus of rehabilitation programmes should be on eccentric hamstring strengthening. The successful completion of either the L-protocol or the Nordic Hamstring protocol should be considered as a main criterion for return-to-play, in conjunction with the current clinically-based return to sport criteria. As mentioned above, evidence has shown that these protocols significantly reduce the rate of injury and reinjury. Further research is needed to determine both compliance and completion of return-to-play protocols following hamstring injuries.

Conflict of Interest: None

Acknowledgements: The UCT Division of Physiotherapy is thanked for the opportunity and guidance in writing this commentary for publication.

References

1. Erickson LN, Sherry MA. Rehabilitation and return to sport after hamstring strain injury. J Sport Health Sci 2017;6(3): 262-270. [doi:10.1016/j.jshs.2017.04.001]
2. Jacobsen P, Witwrouw E, Mutart P, et al. A combination of initial and follow-up physiotherapy examination predicts physician-determined time to return to play after hamstring injury, with no added value of MRI. Br J Sports Med 2016;50(7):431-439. [doi:10.1136/bjsports-2015-095073]
3. Liu H, Garrett WE, Moorman CT, et al. Injury rate, mechanism, and risk factors of hamstring strain injuries in sports: A review of the literature. J Sports Health Sci 2012;1(2):92-101 [doi: 10.1016/j.jshs.2012.07.003]
4. Asklin CM, Tengvar M, Thorstensson A. Acute hamstring injuries in Swedish elite football: a prospective randomised controlled clinical trial comparing two rehabilitation protocols. Br J Sports Med 201347(15):953-959. [doi:10.1136/bjsports-2013-092676]
5. Peterson J, Thorborg K, Nielson MB, et al. Preventive effect of eccentric training on acute hamstring injuries in men's soccer: A cluster-randomized controlled trial. Am J Sports Med 2011;39(11):2296-2303. [doi:10.1177/0363546511419277]
6. van der Horst N, Backx F, Goedhart EA, et al. Return to play after hamstring strain injuries in football (soccer): a worldwide Delphi procedure regarding definition, medical criteria and decision-making. Br J Sports Med 2017; 51(22): 1583-1591. [doi: 10.1136/bjsports-2016-097206]