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Journal of Sport and Health Science 6 (2017) 253–254
www.jshs.org.cn

Editorial

Research in prevention and rehabilitation of hamstring muscle strain injury

Hamstring muscle strain injury is the most common and prevalent injury in sports involving high-speed running, such as American football, Australian football, English rugby, soccer, track and field, and cricket.[1] Hamstring muscle strain injury also has a high recurrence rate of up to 48%.[2] The average practice and game time loss due to hamstring injury is between 17 and 60 days, contingent on the grade of injury.[2] Severe hamstring muscle strain injuries, and associated recurrent injuries, may result in lumber spine abnormalities, knee meniscal problems, adhesion of the lateral popliteal nerve, decreases in quadriceps muscle power, enthesopathies, and dysfunction of the sciatic nerve,[1] injuries that all could end an athletic career.[3]

The high injury and re-injury rates, and severe consequences of hamstring muscle strain injuries, present a need for research on prevention and treatment of this injury. We published this special issue of the *Journal of Sport and Health Science* (*JSHS*) on hamstring muscle strain injury in an effort to promote and facilitate research on the prevention and treatment of this problem. This special issue consists of 2 Parts. Part I includes 1 editorial, 2 opinion, and 4 commentary articles that have been published in the previous issue of *JSHS*; Part II includes 2 review and 3 original articles that are published in the current issue. The 1 editorial, 2 opinion, and 4 commentary articles formed a debate on the possible mechanisms of hamstring muscle strain injuries.[4–10] In order to prevent and treat hamstring muscle strain injuries, it is essential to understand the mechanisms causing the injury. These 2 opinion articles represent 2 schools of thought on the mechanisms underlying muscle strain injury; one considers muscle force, the other muscle strain as the primary determinant of muscle strain injury. We hope that this debate may provide new insights into the possible mechanisms of hamstring muscle strain injury, provide a base for future studies centered on identifying risk factors, and set the stage for novel prevention, treatment, and rehabilitation strategies. Dr. Li Li from Georgia Southern University coordinated this debate. We would also like to thank Drs. Yu Liu, Bing Yu, Hui Liu, William Garrett, Walter Herzog, and Craig Perrin for participating in this debate. Dr. Garrett is an internationally recognized clinician and soft tissue biologist. His studies on the biomechanics of muscle strain injury significantly contributed to the literature on the mechanisms of muscle strain injuries.[11] Dr. Herzog is an internationally recognized expert in muscle biomechanics, and his work contributed to our understanding of muscle biomechanics and musculoskeletal system modeling.

In one of the review articles in this special issue, muscle injury classification systems were summarized in detail, and the strengths and weaknesses of each system were highlighted.[12] Appropriately classifying hamstring muscle strain injuries is important for developing treatment strategies, predicting prognosis, and maybe most importantly determining the readiness for return to play. Based on current evidence, the authors proposed strategies for developing a uniform and consistent classification and grading system for muscle strain injury.

We would also like to thank Drs. Bruce Hamilton, Juan-Manuel Alonso, and Thomas Best for their contributions to this special issue. Dr. Best is an internationally recognized expert in the treatment and rehabilitation of muscle strain injuries. His studies on the biomechanics of muscle strain injuries demonstrated the relationship between strain rate and muscle strain injuries, and they are an important part of the literature on the mechanisms of muscle strain injuries.[13] He is a long time advocator for developing a uniform classification and grading system for muscle strain injuries with the intent to improve treatment outcomes of muscle strain injuries.

In the second review article of this special issue, the current literature on the decision making for return to play after a hamstring strain injury was summarized.[14] Although return to play is arguably the most relevant issue for coaches, athletes, and clinicians, the majority of coaches and athletes focus on minimizing the loss of practice and game time, while clinicians tend to focus on minimizing the risk of recurrence of the injury. A series of factors were proposed that need to be considered when making decisions on return to play after a hamstring muscle strain injury. We would like to thank Drs. Lauren Erickson and Marc Sherry for their contribution to this special issue. Dr. Sherry is a well-known physical therapist with rich experience in the treatment and rehabilitation of muscle strain injuries, especially hamstring muscle strain injuries.

Among the 3 original research articles, 1 is focused on the risk factors of hamstring muscle strain injuries in professional cricket players.[15] Identifying risk factors for hamstring injuries is critical when developing prevention strategies for hamstring injuries and re-injuries. As pointed out by the authors, their findings based on cricket players are also relevant for other sports. We would like to thank Drs. John Orchard, Alex Kountouris, and Kevin Sims for their contribution to this special issue. Dr. Orchard is an internationally recognized

Peer review under responsibility of Shanghai University of Sport.

http://dx.doi.org/10.1016/j.jshs.2017.06.001

clinician and scientist in hamstring muscle strain injury. His recent studies on risk factors of hamstring muscle strain injuries in professional Australian football and cricket provide important information for the prevention of the injury in these 2 sports.

The remaining 2 original research articles contain a mini series of studies on the relationship between flexibility and optimal hamstring lengths, and the maximal strains encountered in the hamstrings in sprint running.[16,17] Sprint running is associated with frequent hamstring strain injuries. Previous studies demonstrated that hamstring muscle-tendon units reach their maximal lengths in the late swing phase of sprinting.[18,19] They demonstrated that hamstring flexibility is significantly correlated to hamstring optimal length, and the maximal hamstring strains encountered during sprinting. These results contribute to the growing body of risk factors for hamstring muscle strain injuries. We would also like to thank Dr. Hui Liu and her research team for their contribution to this special issue.

We hope that the results and information provided in this special issue on hamstring injuries provide useful information for clinical practice and future scientific studies and stimulate research in this fascinating area of clinical and sport biomechanics.

References

1. Liu H, Garrett WE, Moorman CT, Yu B. Injury rate, mechanism, and risk factors of hamstring strain injuries in sports: a review of the literature. *J Sport Health Sci* 2012;**1**:92–101.
2. Ekstrand J, Healy JC, Walden M, Lee JC, English B, Hägglund M. Hamstring muscle injuries in professional football: the correlation of MRI findings with return to play. *Br J Sports Med* 2012;**46**:112–7.
3. Askling CM, Tengvar M, Saartok T, Thorstensson A. Acute first-time hamstring strains during high-speed running: a longitudinal study including clinical and magnetic resonance imaging findings. *Am J Sports Med* 2007;**35**:197–206.
4. Liu Y, Sun Y, Zhu W, Yu J. The late swing and early stance of sprinting are most hazardous for hamstring injuries. *J Sport Health Sci* 2017;**6**:133–6.
5. Yu B, Liu H, Garrett WE. Mechanism of hamstring muscle strain injury in sprinting. *J Sport Health Sci* 2017;**6**:130–2.
6. Herzog W. Eccentric *vs.* concentric muscle contraction: that is the question. *J Sport Health Sci* 2017;**6**:128–9.
7. Yu B, Liu H, Garrett WE. Comment on "The late swing and early stance of sprinting are most hazardous for hamstring injuries" by Liu et al. *J Sport Health Sci* 2017;**6**:137–8.
8. Liu Y, Sun Y, Zhu W, Yu J. Comments to "Mechanism of hamstring muscle strain injury in sprinting" by Yu et al. *J Sport Health Sci* 2017;**6**:139–40.
9. Li L, Wang D. Parallel and cross-sectional hamstring injuries in sprint running. *J Sport Health Sci* 2017;**6**:141–2.
10. Perrin C, Nosaka K, Steele J. Could titin have a role in strain-induced injuries? *J Sport Health Sci* 2017;**6**:143–4.
11. Garrett Jr WE, Safran MR, Seaber AV, Glisson RR, Ribbeck BM. Biomechanical comparison of stimulated and nonstimulated skeletal muscle pulled to failure. *Am J Sports Med* 1987;**15**:448–54.
12. Hamilton B, Alonso JM, Best TM. Time for a paradigm shift in the classification of muscle injuries. *J Sport Health Sci* 2017;**6**:255–61.
13. Best TM, McElhaney JH, Garrett Jr WE, Myers BS. Axial strain measurements in skeletal muscle at various strain rates. *J Biomech Eng* 1995;**117**:262–5.
14. Erickson LN, Sherry MA. Rehabilitation and return to sport after hamstring strain injury. *J Sport Health Sci* 2017;**6**:262–70.
15. Orchard JW, Kountouris A, Sims K. Risk factors for hamstring injuries in Australian male professional cricket players. *J Sport Health Sci* 2017;**6**:271–4.
16. Wan X, Qu F, Garrett WE, Liu H, Yu B. Relationships among hamstring muscle optimal length and hamstring flexibility and strength. *J Sport Health Sci* 2017;**6**:275–82.
17. Wan X, Qu F, Garrett WE, Liu H, Yu B. The effect of hamstring flexibility on peak hamstring muscle strain in sprinting. *J Sport Health Sci* 2017;**6**:283–9.
18. Thelen DG, Chumanov ES, Hoerth DM, Best TM, Swanson SC, Li L, et al. Hamstring muscle kinematics during treadmill sprinting. *Med Sci Sports Exerc* 2005;**37**:108–14.
19. Yu B, Queen RM, Abbey AN, Liu Y, Moorman CT, Garrett WE. Hamstring muscle kinematics and activation during overground sprinting. *J Biomech* 2008;**41**:3121–6.

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Accepted 3 June 2017
Available online 16 June 2017