ARE THERE DIFFERENCES IN CLINICAL AND RUNNING GAIT ASSYMMETRY BETWEEN INJURED AND HEALTHY RUNNERS?

Brar, V, Hannigan, J, and Chou, L-S
Motion Analysis Laboratory, Department of Human Physiology, University of Oregon, Eugene, OR USA
email: chou@uoregon.edu, web: choulab.uoregon.edu

INTRODUCTION

With the increasing prevalence of chronic metabolic diseases such as obesity, type 2 diabetes, and coronary artery disease, clinical and research efforts have shifted towards preventative measures for such illnesses. Aerobic exercise, particularly running, has predominately been identified to be one such preventative intervention [1]. Despite its many benefits, running associated injury rates have been reported to be as high as 79% [2]. Moreover, these unacceptably high rates of injury have been persistent through the years despite significant efforts to reduce injury through advancements in shoe technology, training style, and research [3].

Etiologies of running injuries are highly specific to an individual and the nature of their training. It has been postulated that running injuries stem from both intrinsic factors, such as an individual’s past medical history, running experience and technique, body mass index, strength and flexibility, and extrinsic factors such as shoe selection and training intensity [4]. Asymmetries in strength, structure, and one’s running mechanics have also been found to play a role in increasing the risk of one developing an injury, despite symmetric nature of running [5]. It has been observed that Medial Tibial Stress Syndrome (MTSS) has both the highest prevalence and incidence of injury, followed by Achilles Tendinopathy (AT) when considering running injuries of the lower extremity [6].

The purpose of this study was to investigate whether there are differences in both clinical and running gait asymmetry between healthy and injured runners. It was hypothesized that asymmetries at the hip and ankle, but not the knee will be significant.

METHODS

All subjects were between 18-60 years old. Injured subjects were included if they were currently symptomatic for either AT or MTSS as diagnosed by a clinician and were averaging greater than 20 miles per week before injury. 21 subjects met these criteria, 13 of which were symptomatic for AT and 8 of which were symptomatic for MTSS. Healthy controls not injured for at least 6 months prior were matched with injured individuals based on sex, weekly mileage, age, and foot strike pattern.

Thirty-nine reflective markers were placed on these runners who ran continuous overground laps in the laboratory while whole-body kinematic data were collected using a ten-camera motion capture system (Motion Analysis Corp., Santa Rosa, CA) sampling at 200 Hz. Clinical measurements of range of motion (ROM) were made at the ankle, knee and hip in several planes of motion by an experienced clinician.

Clinical and running gait asymmetry between limbs was calculated using an established method: the symmetry index (SI) [5]. SI can be found by:

\[
SI = \frac{|X_R - X_L|}{0.5 (X_R + X_L)} \times 100
\]

Independent sample t-tests calculated differences between the symmetry indices of injured and control subjects, \(a=.05\).

RESULTS AND DISCUSSION

Our results showed a significant difference in SI between healthy and control runners in clinical ankle dorsiflexion ROM \((p=.037)\). In addition, there was a difference between groups in SI of peak ankle dorsiflexion \((p=0.012)\) and ankle dorsiflexion excursion \((p=0.004)\), with the SI of subtalar inversion trending toward significance \((p=0.062)\).

Given the role of the tibia and achilles in ankle stabilization and motion, these results indicate that injury to these structures result in pathological asymmetry, when compared to healthy runners. As no difference in the amount of asymmetry present at the hip or knee was noted, this suggests that MTSS and AT injuries may arise from asymmetries at the ankle. It is also possible that such results arise as the product of altered mechanics in response to the injury.

CONCLUSIONS

Results of this study may support the utility clinical interventions in decreasing sagittal and frontal plane asymmetry, to manage and treat symptoms of both AT and MTSS in injured runners.

REFERENCES


ACKNOWLEDGEMENTS

The authors would like to thank Dr. Jim Becker for his significant contributions in data collection.