

## S4 - Improving Running Biomechanics Prevents Injury in Novice Runners

Roy CHEUNG Tsz-hei<sup>1,2</sup>, Raymond CHUNG Chi-keung<sup>1</sup>

<sup>1</sup>Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong

<sup>2</sup>Gait & Motion Analysis Laboratory, Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong

**Introduction and Project Objectives:** Running is one of the most popular sports worldwide. However, up to 79% of runners incur a single injury in a given year. Compared to experienced runners, beginners are even more vulnerable. Among different biomechanical risk factors, high level of vertical loading rate has been identified as a key marker to be associated with a wide range of injuries in runners. Previous studies have utilized gait retraining to successfully lower impact loading in runners but it remains unknown whether such a change in the running biomechanics prevents prospective injury. Hence, this randomized controlled trial sought to examine the biomechanical and clinical effect of gait retraining in a group of novice runners.

**Methods:** 320 novice (experience < 2 years) runners were recruited from local running clubs and they underwent a baseline running biomechanics assessment on an instrumented treadmill at 8 km/h and 12 km/h using their usual footwear. We measured vertical average and instantaneous loading rate (VALR and VILR) from the force plate data. All participants were then randomized to either gait retraining or control group. In the gait retraining group, participants received a 2-week gait retraining and they were provided real-time biofeedback of the step-by-step vertical ground reaction force profile. In the control group, participants received treadmill running exercise but we did not receive any feedback on their running biomechanics. The training time was identical between the two groups. Participants were reassessed after the training, and their injury profiles were monthly tracked using an online surveillance platform for 12 months.

**Results:** Runners in the gait retraining group exhibited a significant reduction in the VALR and VILR following gait retraining ( $p < 0.001$ , Cohen's  $d > 0.99$ ), while VALR and VILR were either similar or slightly increased in the control group ( $p = 0.001-0.461$ , Cohen's  $d = 0.03-0.14$ ). 16% runners in the gait retraining group and 38% runners in the control group reported injury at the one-year follow-up. The hazard ratio between gait retraining and control groups was 0.38, indicating a 62% lower injury risk in the runners undergone gait retraining, when compared with controls.

**Conclusions:** A 2-week gait retraining program using real-time biofeedback is effective in lowering vertical loading rates in novice runners. More importantly, by only controlling this biomechanical parameter, the injury risk can be 62% lower in this high-risk group of runners.

Project Number: 12131621