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Effect of sloped walking on ground and joint reaction forces

Abstract

Sloped walking is commonly known to be benefited to health. However, the increase of GRF that contribute to increment to JRF during inclined walking compared to level-ground walking also has been a concern in preventing injury. Therefore, the aim of this study was to assess the effect of sloped walking in comparison with level-ground walking to GRF and JRF at hip, knee and ankle joints. Ten healthy male participants (age: 24 ± 1.2 years old with normal body mass index (BMI)) were asked to walk at preferred speed on customized ramp at the slopes of -5°, 0° and 5°. Kinematic data were captured with five-camera motion capture system (Qualysis Track Motion). Kinetic data were measured with two force plate (Bertex) which embedded into the ramp. A musculoskeletal model (Visual 3D C-motion) was used to assess joint reaction force (JRF) of lower limb. Result show that peak value of mean GRF as well as maximum JRF at all joints of lower limb were higher during sloped walking compared to level-ground walking. In addition, the maximum JRF at hip is the highest, followed by knee and ankle for all walking conditions. GRF had a significant influence to the JRF at lower limb during inclined and declined walking where sloped walking have a higher force at all joints of lower limb than level- ground walking. Therefore, a suitable walking strategy in adapting the forces demand is required in preventing any slope slippage and/or vertical body instability that might lead to musculoskeletal injury.