SYMMETRY OF GROUND REACTION FORCE MEASURES IN SUCCESSIVE FOOTFALLS DURING RUNNING

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INTRODUCTION: Historically ground reaction forces have taken place using a single force platform during running. Dainty and Norman (1987) stated that force platforms must be designed to accommodate foot contact with a minimum necessity of targeting the platform. Such statements are verified by differences in ground reaction force variables when a subject has to alter their stride pattern on the approach to the plate. Differences have been primarily evident during the impact phase for both walking and running (Challis, 2001). The alteration of these kinetic variables was related to modification of lower limb angles at contact with the platform (Challis, 2001). It can be concluded that targeting of the force platform in gait analysis would produce kinetic measures that are not representational, or typical of subjects standard foot contact pattern.
Many of the problems of targeting can be eliminated by sound experimental procedures, such as adequate approach and run-off distances, clear verbal instructions, and ensuring the subject maintains optical focus away from the platform surface. In addition, it is possible to measure footstrikes on more than one force platform. Providing the subject has no major biomechanical deficit, or injury at the time of testing, measurement of successive footstrikes should not yield ground reaction force differences in normal walking or running (Dyson and Janaway, 2000). However, recent results in running (Smith et al., 2004) revealed vertical impact loading rate and braking forces to be greater on the second of two successive footstrikes in soccer players. It was proposed this result could be attributed to increased muscular development on the subjects preferred limb. The aim of the current investigation is to assess the symmetry of successive footstrikes during running, with a secondary aim of investigating differences in force between the preferred and non-preferred limb.

METHODS: Ten male subjects volunteered for testing, wearing their own running footwear. All were in good in good health at the time of testing. Ethical clearance and informed consent were obtained and subjects reminded of their right to withdraw at any time. Testing was performed on a polyflex runway conforming to IAAF regulations. Data from two force platforms was recorded using Kistler 9851 amplifiers (Kistler, Alton, UK), connected to Kistler Bioware software. The platforms sampled at a rate of 500 Hz with a horizontal plane offset of 0.017 m to account for the depth of the polyflex covering. Subject velocity was recorded using three pairs of hip-height infrared light timing-gates (University College Chichester, Chichester, UK) located over an 8m distance, either side of the force platforms. Inter timing-gates spacing was 3m, 3m and 2m. Subjects performed 10 satisfactory trials at 4 ms^{-1}. Data was checked online before storage, and trials rejected if the experimenter deemed the subject to have targeted the force platforms, or not maintained a constant velocity.

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