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Peak tibial accelerations in different foot strike patterns during level running: an independent investigation in different cohorts

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ABSTRACT

Peak tibial accelerations are used to monitor impact severity during distance running and as input for bio-feedback. Here, peak tibial accelerations were compared between rearfoot and forefoot strikes. Two different studies were undertaken by independent research centres. Tibial acceleration and optical motion capture were collected in 14 rearfoot strikers who changed to a forefoot strike in the first centre. In the second centre, tibial acceleration of 14 other rearfoot strikers and nine forefoot strikers were collected and processed. In over-ground level running at a submaximal speed, the resultant peak tibial acceleration was greater in the instructed forefoot strike condition ($\Delta X = 7.6 \pm 1.3$ g, mean ± standard error difference) and in the habitual forefoot strikers ($\Delta \bar{X} = 3.7 \pm 1.1$ g) than in the rearfoot strikers. The shank kinematics revealed a greater decrease in antero-posterior velocity following touchdown in the forefoot strike condition. The forefoot strikes experienced greater posterior tibial acceleration, which resulted in an increased resultant peak tibial acceleration that also occurred earlier than in the rearfoot strikes. No significant difference in axial peak tibial acceleration was found between these foot strike patterns. In conclusion, the foot strike pattern differently affects peak tibial accelerations in level running, which can have implications for monitoring and biofeedback applications.

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Introduction

Running has been suggested as the barometer of sport biomechanics research (Miller, 1984). An area of interest within this field is how segments of the body behave during foot-ground contact. In previous studies, researchers have looked into the tibial

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