

MEETING ABSTRACT

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Comparison of ankle joint kinematics of a single athlete during an ankle inversion sprain incident and normal non-injury motions

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Introduction

The purpose of this study was to compare the ankle joint kinematics including the angles, and their respective angular velocities of a tennis player during an ankle sprain incident and normal non-injury motion. And to deduce whether the sideward cutting motion of the athlete is an intrinsic factor to an ankle sprain.

Methods

Model-Based Image Matching (MBIM) motion analysis technique allows us to understand the leg movement

quantitatively by analyzing the three-dimensional human motion. With validation, it has been used to obtain ankle kinematics during ankle sprain incidents in various sports [1]. In this study, a sideward cutting motion performed by a female athlete was compared against her injured incident reported in 2012 [2].

Results

Figure 1 and figure 2 show the right ankle kinematics profile of inversion, internal rotation, and plantarflexion during a sideward cutting motion to the right. Previously,

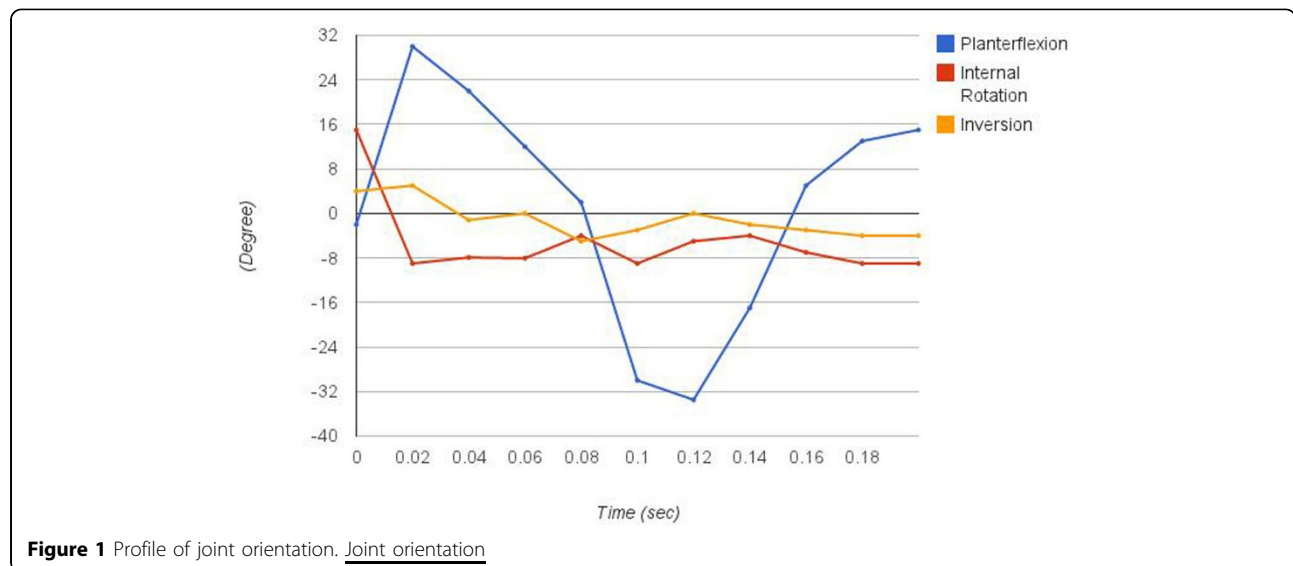


Figure 1 Profile of joint orientation. Joint orientation

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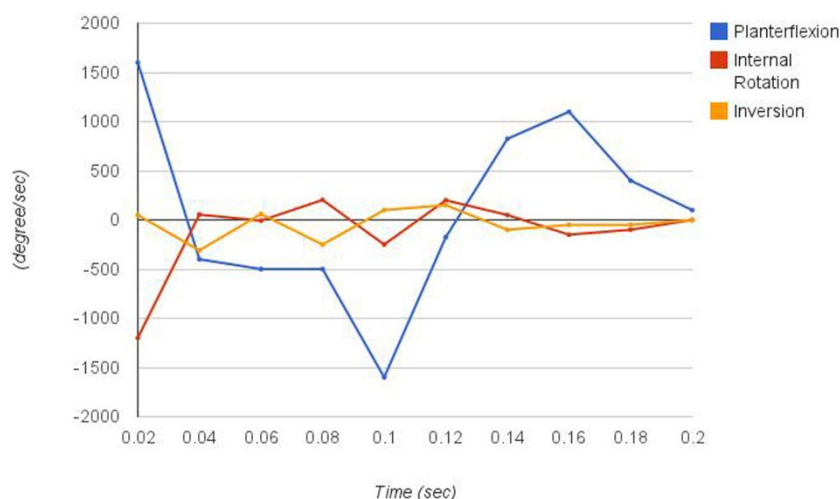


Figure 2 Profile of angular velocities. Joint velocity

the same athlete got injured performing a similar motion, regarding that incident, her peak inversion angle was reported to be 67° , which happened 0.17 second after foot strike [2]. The peak inversion angle of this case is 5° , significantly smaller compared to the injured case. The range of inversion angle was 5° eversion to 5° inversion. The degree of fluctuation of the angle of plantarflexion is greatest among the 3 planes of motion. It ranges from -33.5° to 30° . The peak velocity is $1600^\circ/\text{sec}$ for both ways, doriflexion and plantarflexion.

Conclusion

This study further demonstrates that the sideward cutting motion does not require internal rotation and inversion, instead, ankle goes from plantarflexed to doriflexed, and then back to plantarflexed in a short time. An inverted ankle orientation on landing could be the inciting event of an ankle sprain when performing similar motion. However, a rapid joint motion in the plantarflexion/doriflexion plane is not likely to cause an ankle sprain. Therefore, the risk of performing the sideward cutting depends mostly on the ankle orientation during landing.

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