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Changes of foot stiffness in bounding

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【Purpose】 The purpose of the study is to examine one of foot functions by deriving stiffness during dynamic task such as bounding between athletes and non-athletes.

【Methods】 Among 12 healthy young participants, 6 of them were competitive sprinters. Participants were instructed to perform bounding on the force platform. The sole plane was defined by markers on 1st, 5th MP joints and heel. The stiffness of the foot in this study was derived from the displacement of a marker on navicular in the direction normal to the sole plane and the portion of the floor reaction force applied in the same direction at the moment of bounding.

【Results】 The foot increased its stiffness as a function of landing time. The coupling between the landing time and the stiffness was much tighter in the sprinter group than in the non-sprinter group. The sprinters generated significantly higher ground reaction force in much shorter landing time. On average, the stiffness of foot of the sprinters was higher than that of non-sprinters.

【Discussion】 Since the stiffness of the foot changes across different conditions, the regulation of foot stiffness can be attributed to the level of activities of muscles such as tibialis posterior, flexor hallucis longus and peroneus longus. Sprinters appear to make use of the stiffness property of the foot much more efficient than non-sprinters. The foot stiffness may be a tool to evaluate the degree of recovery from foot injuries among athletes.