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Biomechanical analysis of an inciting event of ankle sprain on basketball players

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Introduction

Lateral ankle sprains are very common among basketball players and are responsible for great time lost in practice. Nevertheless, having the same exposure to risk by playing basketball, some athletes never sprain their ankles while others do. The aim of this study is to understand the main kinematics and electromyography differences in basketball players during the dynamic activity that causes more sprained ankles in basketball: jump to unstable surface.

Methods

24 elite basketball players, (12 females, and 12 males) underwent the same test procedures consisting of five consecutive jumps in unipodal support. Barefoot athletes with (NS) healthy (n = 17) and already sprained (S) ankles (n = 28) were asked to jump from the floor to an unstable surface in all directions (round Freeman board) placed 50 cm in front of them. Three experimental jumps were executed before data collection to familiarize the subject with the protocol and maximize the height of the jump (figures 1ab). This design aimed to reproduce the most vulgar mechanism of ankle sprain in Portuguese basketball players: landing in another player's foot, which temporarily becomes an unstable surface. EMG data (1600 Hz) was recorded using bipolar, pre-amplified surface EMG electrodes (Daisy Lab), placed over four lower leg muscles (Tibialis Anterior TA, Peroneus Longus PL, Gastrocnemius Lateral GL and Medial GM). Motion data (100 Hz) was recorded using an electromagnetic tracking

device with 3 sensors located in each segment (foot, shank and thigh) of lower limb.

Data was analyzed in four phases of movement: prepare to jump, push-off; ascending flying and descending flying that culminate on the contact moment.

Results

During jump athletes with already sprained ankles showed less flying time ($-p < 0,01$), probably leading to less preparation for contact and load (NS: $-0,111 \text{ sec} \pm 0,043$; S: $0,103 \text{ sec} \pm 0,030$). This could be the result of less accurate anticipatory postural adjustments by central nervous system of athletes that already sprained their ankle, which wouldn't anticipate the equilibrium disturbance caused by the whole sequence of movements [1]. Konradsen [2] findings suggest a risk for ankle sprains when there is an ankle-position error. Regarding to landing kinematics, we found that knee and ankle angles at contact did change significantly with previous ankle sprain (table 1).

Table 1: Knee and ankle angles on landing (deg)

	Healthy	Sprained	P Ancova)
Knee Flexion	17,49 ± 12,52	14,63 ± 10,77	p < 0,05
Ankle planta flexion	-3,38 ± 10,04	-9,75 ± 14,18	p < 0,01

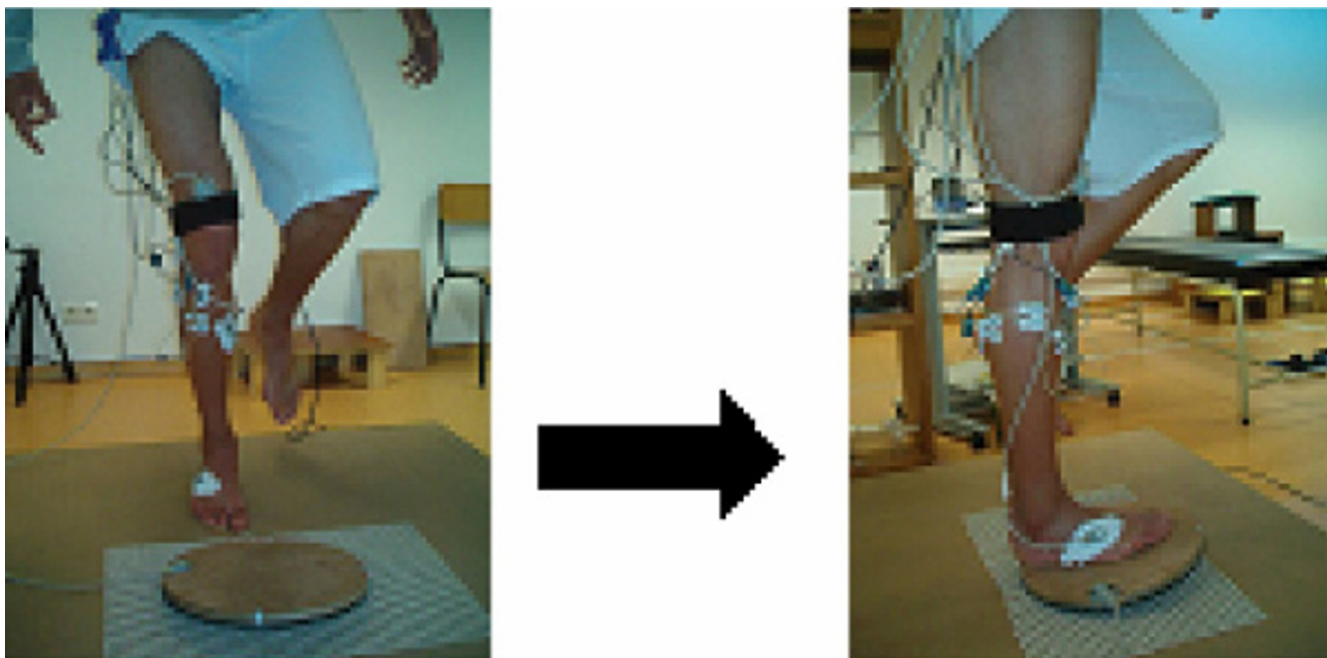


Figure 1
Athletes jumping a) from a stable surface to b) an unstable board.

Although differences on landing moment are far more obvious for the ankle, they also become visible for knee flexion. Healthy subjects showed more knee flexion and less ankle plantar flexion on contact which gives them a better arrangement for lower limb impact absorption and creates a safer position for ankle load. They also showed lower muscle activity for all muscles with exception of TA which contraction is significantly different on both groups on landing.

Conclusion

This study identified different movement behaviour for the lower leg of healthy versus previous sprained ankles during the jump, which could possibly prevent the athlete from preparing for contact and supporting moment, leading to an ankle sprain, especially because of an ankle position in greater risk. Healthy athletes take more time preparing lower limb for contact moment and further load. These findings also suggest that healthy athletes manage to arrange a better position for lower limb to land, which may be a sign that there might be necessary to train athletes' jumps in "safe positions" in order to prevent ankle sprains.

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References

1. Le Pellec A, Maton B: *J Electromyogr Kinesiol* 2000, **10(3)**:171-8.
2. Konradsen L: *J Athl Train* 2002, **37(4)**:381-385.

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