DIFFERENCE IN LANDING KINETICS DURING SIMULATED ANKLE SPRAIN MOTION BETWEEN CHRONIC ANKLE INSTABILITY AND HEALTHY PARTICIPANTS

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Abstract
The lateral ankle sprain is the most common athletic injury, and many people who suffer an ankle sprain develop chronic ankle instability (CAI). The purpose of this study was to examine the ground reaction force during a simulated lateral ankle sprain among participants with no history of ankle injury and those with CAI. Twelve participants, which included six with CAI and six with no history of ankle sprain performed 14 repetitions of a vertical drop down off a 27 cm box, landing on an AMTI force platform. Seven trials were completed with a fulcrum outer sole strapped on to the bottom of the participant’s shoe. The fulcrum outer sole caused 25° of inversion upon landing, and seven trials were performed with a flat outer sole. Outer sole assignment was randomized. Peak vertical, anterior/posterior, and medial/lateral ground reaction force, normalized to multiples of body weight (BW), were measured for each participant. Results revealed that the no injury group landed with significantly greater (P<.05) peak vertical weight (BW), were measured during the trials for each participant. Statistical analysis included a 2 x 2 ANOVA with repeated measures on outer sole condition to analyze the difference in landing kinetics between the injury and outer sole variables. The alpha level was set at P<.05.

Introduction
A lateral ankle sprain occurs in people while playing sports, walking on an uneven surface, or simply mis-stepping (1). A lateral ankle sprain can cause chronic instability of the ankle (CAI), swelling, and pain (2). The ligaments and muscles at the ankle joint help absorb energy from contact force with the ground when stepping or landing from a jump. If these are damaged during the initial sprain, there could be a change in amount of force at the ankle joint upon ground contact, which could help predict the possibility of another sprain occurring (3). The purpose of this study was to examine the ground reaction force during a simulated lateral ankle sprain mechanism among participants with no history of ankle injury and those with CAI.

Methods
Twelve participants (age = 21.83 ± 2.51 years; mass = 72.42 ± 12.53 kg; height = 1.74 ± 0.11 m), which included six with CAI and six with no history of an ankle sprain (NI), performed 14 repetitions of a vertical drop down off a 27 cm box, landing on an AMTI force platform. CAI participants had sustained one moderate ankle sprain with a recurrent sprain within past 6 months and scored less than 90% on FADI and FADI-S. Each participant performed 14 repetitions of a vertical drop down off a 27 cm box, landing on an AMTI force platform. Seven trials were completed with a flat outer sole, and seven trials with a fulcrum outer sole strapped on to the bottom of the participants’ shoe. The fulcrum outer sole caused a 25° inversion when landing. The outer sole assignments were randomized, and the participants were blind to which sole was being used. The peak vertical, anterior/posterior, and medial/lateral ground reaction forces (GRF), normalized to body weight (BW), were measured during the trials for each participant. Statistical analysis included a 2 x 2 ANOVA with repeated measures on outer sole condition to analyze the difference in landing kinetics between the injury and outer sole variables. The alpha level was set at P<.05.

Results
The results showed the NI group landed with a significantly higher (P.< .05) peak vertical GRF (NI = 1.75 ± 0.37 BW; CAI = 1.38 ± 0.17 BW; P = 034) and higher peak anterior/posterior GRF (NI = 0.27 ± 0.07 BW; CAI = 0.19 ± 0.04 BW; P = 033) than the CAI group. Figure 1 shows the means and standard deviation for each of the forces between the groups. Significant difference between the two groups is represented by (*).

Conclusions
The peak vertical and anterior/posterior GRF was different between the group with CAI and the NI group. The differences between the groups may be an attempt by the CAI group to change the loading on the injured ankle and shift the center of mass upon landing. These changes may lead to an increased chance of having a lack of stability within the ankle joint. The instability could increase the risk for another ankle sprain to occur during normal gait or when landing from a jump, due an alteration of force and body mechanics upon landing.

References