

Effects of Dance Footwear on Kinetics and Lower Limb Joint Kinematics During Sauté Jumps

ELOISA HERNANDEZ, ERIN ONAT, KEVIN PHAN, JENNY CAMACHO, RICARDO TOLENTINO, & DANIELLE N. JARVIS

Laboratory for Evaluating Athletic & Aesthetic Performance; Department of Kinesiology; California State University, Northridge; Northridge, CA

Category: Undergraduate

Advisor / Mentor: Jarvis, Danielle N. (danielle.jarvis@csun.edu)

ABSTRACT

While some efforts have been made to design footwear that would be beneficial for dancers in terms of performance and injury prevention, most footwear commonly used by dancers offers very little support to the foot and ankle region. Footwear has the potential to modify the interaction between the foot and the floor, but there is minimal research examining the effects of footwear on dance performance. **PURPOSE:** The purpose of this study was to investigate the effects of footwear on ground reaction forces and lower extremity joint motion during a sauté (dance specific bipedal vertical jump) landing. **METHODS:** Eighteen healthy, experienced dancers provided informed consent to participate in this IRB-approved study. Three-dimensional analysis was performed using a 12-camera video motion analysis system (Motion Analysis) and two force plates (Kistler). Participants performed ten consecutive sauté jumps while barefoot, wearing Apolla dance socks, wearing regular socks, and wearing Bloch Spin II dance shoes, with the order of conditions randomized for each participant. The digital camera signals were processed and analyzed using Cortex software. Visual3D software (C-Motion, Inc.) was used to quantify ground reaction forces and hip, knee, ankle, and toe kinematics. Results between footwear conditions were compared using repeated measures ANOVAs. **RESULTS:** There were no differences in peak vertical ground reaction force between footwear conditions ($\lambda(3,11)=0.955, p = 0.912$). There was a main effect of footwear on peak lower extremity joint kinematics ($\lambda(6,12)=0.163, p < 0.001$). Peak extension of the MTP joints was reduced while wearing both the Apolla dance socks and the Bloch shoes ($-19.1 \pm 11.6^\circ$ barefoot, $-12.6 \pm 6.4^\circ$ Apolla, $-19.6 \pm 8.3^\circ$ socks, $-10.7 \pm 6.4^\circ$ Bloch). **CONCLUSION:** Preliminary results from this study indicate that Apolla dance socks and Bloch Spin II shoes may provide some protection for the MTP joints in dancers performing jumping movements by reducing peak joint extension. Future analyses examining joint kinetics and other dance movements may allow for more evidence-based recommendations regarding footwear use in dancers.