Hill running, both up and down, is often used as a foundational training mechanism to build strength and speed. Distance runners in particular are at an increased likelihood of encountering steep hills during long training runs. There is limited research available regarding downhill running, and there is no research available on the biomechanics of females during downhill running, or on the biomechanics of steep hill running. The purpose of this study was to quantify the biomechanics of downhill running at four different grades compared to level in female distance runners, and to determine the potential injury risk when running downhill. Fifteen healthy, female distance runners between the ages of 18 and 35 who ran a minimum of 15 miles per week with no lower extremity injuries participated in this study. Participants ran on a force-instrumented treadmill at 4.0 m/s for 1-3 minutes at 0%, -5%, -10%, -15%, and -20% grades, with 3-5 minutes of rest between each condition. Study findings indicated increased ground reaction forces and loading rates, greater power absorption at all three lower extremity joints, increased range of motion at the knee, decreased hip and knee flexion and increased trunk extension at initial contact, and increased knee and hip adduction moments. The results from this study indicate that there is a potentially greater risk for overuse injury when running downhill.
compared to running on a level surface. Individuals should be aware of these findings when planning and implementing training programs so that overuse injuries may be avoided.