

Abstract

THESIS: Effects of Varied Speed and Grade on Downhill Running Trunk Motion and Gait Characteristics

STUDENT: Crystal Hajek

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Background: Running related injuries occur between 20–25.9% per 1000 running exposure hours (1–5). Many factors contribute to this risk including experience, training habits, biomechanics, running surface, and elevation changes. Stress fractures are a common injury in track athletes and distance runners (6) and are associated with increased loading rates (7), which have been observed in downhill running (DHR)(8). Benefits accompanying incline training include improved maximal speed, stride rate (SR) and decreased contact time (9). DHR has shown to improve agility and change-of-direction ability (10) but has been linked to increased low back pain from bending and twisting related to muscle and lumbar region strains (11,12). However, trunk motion and gait characteristics have not been assessed beyond –15% grade in DHR. The purpose of this study was to examine experienced runners' trunk motion and gait characteristics at different speeds and DHR grades. **Methods:** Seven participants (21 ± 1.91 years; 167.44 ± 6.56 cm, 62.07 ± 11.49 kg) completed randomized running trials at various speeds and grades (3.0, 3.5, 4.0 m/s; 0, –7, –14, –21% grade). **Discussion:** The present study revealed significant changes occurred at the steepest grade: increased SR, vertical ground reaction forces, and decreased stride length (SL). At the slowest speed, SL increased while SR decreased up to –

14% grade but increased at -21% while SL decreased. However, at the fastest speed, SR and SL decreased between -14 and -21% grade. This suggests changes in running mechanisms at different speeds and steeper grades than compared to level ground and shallow grades. Gait modifications at steep grades are likely to keep the center of gravity above the base of support. Observed zGRFs increases may lead to an increased injury risk, specifically at steeper grades.