41. SWACSM Abstract

Mechanics of Running Grade Ability

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ABSTRACT

Gait efficiency while running on level ground surfaces has been analyzed by numerous mechanists, however with the dynamic of elevation changes during running, more research is needed to educate runners on how to optimize their energy usage running up and downhill. **PURPOSE**: In this study, we focused on determining whether certain running mechanics would predict a runner's ability for uphill versus downhill running. **METHODS**: Twenty-one experienced runners ran uphill, level, and downhill while having oxygen uptake measured. Conditions were performed in random order and repeated on a second day. Runners used the Saucony TypeA shoe for all conditions. Oxygen measures were averaged over the final three minutes of each five minutes run at each condition. A best-fitting line was generated through oxygen uptake versus grade to classify uphill/downhill running ability. The steepness of this slope indicated whether runners were more economical at uphill or downhill running. Various running mechanics were measured using Vicon Nexus and a Bertec treadmill. A linear regression determined any correlations between peak vertical force, stride rate, plantar velocity, and ground time against uphill/downhill running ability. **RESULTS:** Peak force was the only factor associated with uphill/downhill running ability ($p<0.01$). The slope of oxygen uptake versus grade averaged 0.076±0.278 ((ml/kg/min)/%grade). **CONCLUSION**: Runners that naturally select a higher peak vertical force when running on level ground tend to be more economical in downhill running.