Do you run hill workouts? Here is what you need to know to run and train on hills.

1. Runners who take more steps/minute on downhills perceive less soreness and experience less strength loss compared to runners who take less steps/minute.

2. Speed up on the level section of a course immediately following a downhill section.

3. Downhill running is not limited by oxygen consumption. The pace of downhill running is most likely constrained to limit musculoskeletal injury. Caution is advised.

Downhill running causes greater muscle strain and soreness than an equivalent bout of level running due to increased eccentric muscle action. The lowering, braking, and shock absorbing movements that occur in downhill running involve eccentric muscle actions. These actions involve the contraction of a muscle while it is simultaneously lengthening.

Manipulating the stride length of downhill runners effects the symptoms of exercise induced muscle damage (Rowlands et al., 2001). In this study runners ran downhill for 45 minutes and were divided into 3 groups: overstride, understride, and preferred stride frequency. Stride frequency was decreased to elicit a larger stride length in the overstride group (92% preferred stride frequency) and increased to elicit a shorter stride length in the understride group (108% preferred stride frequency). All groups developed delayed onset muscle soreness. The extent of muscle soreness was greatest for the overstride group. All groups lost quad strength. The understride group had the least amount of strength reduction. Take home point: A runner who normally takes 90 steps/minute/leg could try increasing the frequency to 97 steps and avoid taking 83 steps to attempt to reduce exercise induced muscle damage. Please note that all groups experienced less muscle damage and soreness after running a second 45 minute downhill run 2 weeks after the first due to a training effect. However, the decreased muscle damage during the first downhill run of the understriding group may not have provided as much protection against symptoms of muscle soreness in subsequent runs when running with increased stride lengths. Therefore, runners who normally understride on downhills in training, should not change tactics especially if they are in a race.

On level courses runners spontaneously vary their pace to maintain a relatively constant level of effort. On undulating terrain the pace is slower on uphills and faster on downhills compared with level sections. Downhill speed is increased substantially less than uphill speed is reduced. Runners on a 10 km hilly course have shown oxygen consumption to limit speeds on uphill sections but not on downhill sections. (Townshend et al., 2010). The oxygen consumption over the 10 km course averaged 100% of runner's individual ventilatory threshold on uphills, 79% on downhills, and 89% on level sections. In a study looking at downhill sprints, the maximal speed that could be achieved during one sprint was higher during downhill running than during level running (Baron et al., 2008). However, the average pace sustained during 10 sprints on downhill or level surfaces were not significantly different despite lower heart rates and blood lactate concentrations during downhill running. Downhill running is not limited by oxygen consumption. The most probable explanation limiting downhill running speed is the greater mechanical stress imposed by the eccentric muscular component of downhill running. The pace is likely constrained in order to minimize the risk of musculoskeletal injury.

Downhill running speed shows wide individual variation. Improving speed on downhill sections offers a potential opportunity for improving performance on hilly courses. Unfortunately the risk of injury limits the utilization of this strategy.

One possibility for minimizing time on hilly courses may be to run faster on the level sections immediately following downhills. Although speeds are elevated for a short time on level sections immediately after downhills, the oxygen consumption on these sections is still well below what runners can sustain.

Have fun running the hills,
Laura

The above content is for educational purposes only and is not a substitute for training advice, medical advice, diagnosis, or treatment. Always talk to your physician and qualified health care professional and qualified coach for your specific training, health, and medical needs.

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References

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