

# Manipulating Cadence for Gait Re-training in Runners

**Christine Martin Morgan, PT, DPT, SCS and Heather K. Vincent, PhD, FACSM**

Common lower-extremity running injuries may be related to slow cadence and excessive stride length (2). A simple way to lower injury risk is to manipulate cadence. Manipulating cadence can easily be done in the clinic with the use of a treadmill, metronome, and a motion capture device, such as a high-speed camera, tablet, or a smartphone. Running motion can be reviewed using one of multiple applications, such as Hudl Technique, Dartfish, or Coach's Eye. A 5% to 10% increase in cadence from the self-selected speed can immediately decrease total work at the knee (1) and improve running kinematics, such as decreasing stride length, center of mass vertical excursion, ground reaction force, and impact shock (2). There is not a single cadence value for all runners, and therefore, the following steps should be used to help runners find the cadence that is effective for them:

1. The runner will run on a treadmill at a self-selected speed for 1 to 2 min. Record running motion from the frontal and sagittal planes. Capture cadence using a metronome or smartwatch.
2. Add 5% to the runner's self-selected cadence value. Set the metronome at the new cadence and have the runner run at that cadence for 1 to 2 min, occasionally giving auditory cues to maintain the correct cadence.
3. Ask the runner whether symptoms are improved. If not, try increasing cadence an additional 5% to see if symptoms improve during the session. This increase

might need to occur over a couple weeks for the runner to adequately achieve a higher cadence without increased perceived effort. Record the runner from the frontal and sagittal planes at this new cadence.

4. Review the film with the runner if using a tablet/smartphone. Show the runner that at a higher cadence, the stride length shortens, foot strikes occur closer to the hips with the knee more flexed and the hip less adducted. This gives the runner additional visual feedback to manipulate gait. Many programs exist for the patient to download music of the preferred cadence (*e.g.*, iTunes), and smartphone applications, such as Spotify Running, which will only play music that is set to a specific cadence.

A potential pitfall to manipulating cadence includes faster fatigue onset during running. Fatigue may be mitigated by instructing the runner to use a graduated run-walk program and to decrease overall running distance while acclimating to the new cadence.

## References

1. Heiderscheit B, Chumanov E, Michalski M, *et al.* Effects of step rate manipulation on joint mechanics during running. *Med. Sci. Sports Exerc.* 2011; 43:296–302.
2. Schubert AG, Kempf J, Heiderscheit BC. Influence of stride frequency and length on running mechanics: a systematic review. *Sports Health.* 2014; 6:210–7.

---

Address for correspondence: Christine Martin Morgan, PT, DPT, SCS, UF Health Rehab-OSMI, Gainesville, FL; E-mail: machri@shands.ufl.edu.

1537-890X/1606/381  
Current Sports Medicine Reports  
Copyright © 2017 by the American College of Sports Medicine