INTRODUCTION

The most arduous and strategic part of a triathlon is the transition from cycling to running. Authors of lay publications suggested various cycle to run methods to optimize this transition. For example, Brick (1996) recommended concluding the cycling stage with a low-resistance, fast cadence spin. In contrast, Friel (1998) advocated high-resistance, low cadence frequencies during the final moments of the cycling bout. However, these ideas remain controversial and are not based on scientific evidence.

Some research studies have investigated the effects of prior cycling on subsequent running. In a previous study, we compared running kinematics and performance during maximal run after high-intensity cycling versus after a high-intensity running bout (Gottschall and Palmer, 2000). We found that cycling prior to running elicited kinematic adaptations during the maximal run: stride frequency increased, stride length decreased, and efficiency increased. Yet, that study did not directly investigate how cycling affected running speed and running biomechanics.

It is plausible that cycling cadence could influence subsequent running frequency and hence, speed. Classic studies in neuroscience, by Brugger and Gardener (1994), have demonstrated that persons performing a rhythmic activity for an extended period of time will involuntary continue this movement pattern. This phenomenon is called perseveration.

The rationale for the present study was that cycling cadence might influence subsequent running speed via changes in stride frequency. We hypothesized that compared to the preferred cadence, a fast cycling cadence would increase subsequent running speed and a slow cycling cadence would decrease running speed.

METHODS

Thirteen male athletes of the University of Colorado triathlon team volunteered (24.8 ± 1.20 yr, 72.7 ± 1.42 kg, 1.80 ± 0.02 m, mean ± SD).

Each participant completed three sessions of testing. During the control condition (CC), each participant completed a 30-minute cycling bout immediately followed by a 3200 m running bout. Heart rate was recorded every two minutes so the participants could monitor and maintain similar intensities during the second and third sessions. During the fast condition (FC) and the slow condition (SC), each participant completed a 30-minute, high-intensity cycling bout at a cadence 20% faster or 20% slower than the control condition. The cycling bout was immediately followed by a 3200 m run at the same heart rate intensity as during the control run.

RESULTS AND DISCUSSION

Our most important finding was that faster cadence cycling substantially increased the subsequent average running speed of the
3200-m race effort (Figure 1). During the fast condition, participants ran almost a minute faster than during the slow condition. This remarkable increase in running speed after cycling with a fast cadence occurred with heart rates matched to the values of the control condition during both the cycling and running bouts.

The participants ran faster primarily by increasing stride frequency (Figure 2). Immediately after each cycling bout, the participants ran with a stride frequency that reflected the prior cycling cadence.

In contrast, there were no significant differences between conditions for stride length (Figure 3).

Perseveration is the most likely mechanism responsible for the elevated running stride frequency of the fast condition. Hudson (1968) determined that cycling and running depend on different neural firing rates due to the specific cyclic frequencies of each movement. It is possible that the neural firing rate after each cycling condition biased the firing rate used subsequently for running. For example, the high frequency firing rate during the fast cadence cycling bout appears to have translated into an increased SF during the running bout.

In conclusion, we found that cadence during a cycling bout immediately prior to a running bout influenced performance and stride kinematics. Maintaining an unusually high cadence while cycling resulted in substantially faster running speed. On a practical note, athletes may benefit from adapting an increased cycling cadence prior to the running segment of a triathlon.

REFERENCES