THE NOT-SO-COMPETITIVE EDGE: DETERMINING OPTIMAL CADENCE IN RECREATIONAL RUNNERS

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Background

Recreational runners often use running as a means to continue long and healthy lifestyles. However, 25 to 70% of runners suffer overuse injuries a year (Ferber, et al., 2009). One risk factor related to overuse injuries are a runner's biomechanics. Of a runner's biomechanics, stride rate (SR) is a variable that is fairly easily modified by a runner and has potential benefits for not only reducing injury risk but also improving running performance (Daniels, 2005; Lieberman, et al., 2015; Mercer, et al., 2003).

A SR of 180 steps per minute is often touted as optimal for running efficiency based on a key study conducted on Olympic distance runners (Daniels, 2005), and the running community adopted the mantra of "180 steps/min or more" as best for all runners. While competitive distance runners' preferred SRs are between 170 and 180 steps/min (Leiberman, et al., 2015), recreational runners and physically-active non-running individuals, prefer 156 - 170 steps/min, with an average SR of 169 steps/min (de Ruiter, et al., 2014; Lieberman, et al, 2015). It is not known if the lower SRs observed in recreational runners are related to limited miles, less experience, or slower speeds. Moreover, limited research has combined key biomechanical measures related to injury risk with running economy data on recreational runners in efforts to determine optimal SRs that could improve running economy and lower the risk of overuse injuries. Thus the purpose of this study is to identify if 180 steps per-minute is the optimal SR for non-competitive, recreational runners and differences in biomechanical and physiological factors at different SRs in this population of runners.

Methods

For this study, 20 healthy recreational runners will be recruited. Subjects must be 18 years old and run at least two to three, 3-4 mile runs a week. Subjects who had been running recreationally for 2 years or more will be categorized as “experienced recreational runners” and subjects who have just started running within the last 12 months will be categorized as “novice recreational runners”.

There will be two testing sessions: one to measure running biomechanics and one to measure running economy. During the initial testing session, subjects will two-minute intervals on treadmill to determine preferred speed. Preferred SR will be found by counting steps for 15 seconds for each minute at preferred speed. Both sessions will require the subject to run at their preferred speed and SR as well as four other SRs (150, 160, 170, 180 steps/min). For each stage SR, HR and RPE will be recorded.

Biomechanical data will be collected using a Vicon motion capture system, high speed video, and a tibial accelerometer, from which foot angle at initial contact (IC), ankle to knee distance, ankle to hip distance at IC, and peak tibial acceleration data will be calculated. Subjects will run at each SR for 2.5 minutes.

Metabolic data will be collected using TrueOne metabolic system, from which running economy (VO2) will be measured. Subjects will run at each SR for 5 minutes. Biomechanical and physiological variables will be analyzed with 2 x 5 (group: experienced v. novice x SR) ANOVAs with repeated measures on SR. Alpha = 0.05.

Results

To date, data has been collected on 9 subjects. The running economy data has been analyzed for 6 subjects (Table 1). The average speed of the 6 runners is 7.4 mph with an average preferred SR of 165.5 steps/min. While no statistical analyses have been performed yet, HR and VO2 appear to be lowest at the runner's preferred SR.

Table 1. Average HR, RPE, VO2 for Physiological Testing across all subjects.

	Preferred	150 steps/min	160 steps/min	170 steps/min	180 steps/min
HR (bpm)	158.67	168.83	170.2	168.6	170.8
RPE	12.5	11.5	10.58	12.83	12
VO2 (ml/kg/min)	38.82	40.16	40.47	40.77	40.66

Discussion and Conclusion

It is anticipated that data analysis will be done by the end of April. Due to the limited research on optimal SR on recreational runners, recreational runners may benefit from knowing which SRs are optimal for improving performance. Combining biomechanical measures with running economy will provide insight into key biomechanical variables that are related to injury risk at different stride rates for these runners.

References

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