Can Changes in Running Biomechanics Under Body Weight Support Conditions Lead To Improvements in Aerobic and Anaerobic Energy Capacities?

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ABSTRACT

During the ground contact phase of running, muscles in the lower limb are required to generate force to support body weight which is the most energy-demanding task during running. We are interested in understanding how running mechanics change when we reduce the need for body weight support and how these effects determine maximal metabolic power at top speed. **PURPOSE:** We aim to determine the biomechanical determinants that underlie peak metabolic power during body weight (BW)-supported running. **METHODS:** Twenty-five healthy young adults (age 18-36, M/F, BMI < 30.0) who are experienced runners will be recruited for this study. Subjects will complete a graded exercise test to determine their peak metabolic power output at 100% BW at 75% BW. During each trial, subjects' rates of expired oxygen and carbon dioxide, stance and leg swing times, rating of perceived exertion (RPE), and heart rate will be recorded. **RESULTS:** Our preliminary findings show that similar peak metabolic power output values, at top speeds, were achieved at 100% BW (17.1 W/kg) and 75% BW (16.5 W/kg). In general, as speed increased, average stance time decreased in both BW conditions, while average swing time remained roughly constant. Most notably, at top speed, stance time decreased to 0.19 sec at 75% BW (as opposed to 0.24 sec at 100% BW), indicating much faster rates of force generation along the ground. **CONCLUSION:** It appears that at a lower body weight, reaching peak metabolic power at top speed is primarily achieved by decreasing stance time, and not by swinging the legs faster or increasing peak ground forces. This suggests that reaching peak metabolic power, at top speed, is modulated by different mechanical mechanisms which may reflect potential changes in the underlying contractile behavior of the leg muscles and their dependence on aerobic and anaerobic energy supplies. Our future work will focus on understanding whether these mechanical changes in achieving top speed at a lower body weight has potential for improving running performance.