

[Med Sci Sports Exerc.](#) 2007 Apr;39(4):680-7.

Why does power output decrease at high pedaling rates during sprint cycling?

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PURPOSE: The objective of this study was to partly explain, from electromyographical (EMG) activity, the decrease in power output beyond optimal pedaling rate (P_{ROpt}) during sprint cycling. **METHODS:** Eleven cyclists performed four 8-s nonisokinetic sprints on a cycle ergometer against four randomized friction loads (0.5, twice 0.75, and 0.9 N x kg⁻¹ of body mass). Power output and EMG activity of both right and left gluteus maximus, rectus femoris, biceps femoris, and vastus lateralis were measured continuously. Individual crank cycles were analyzed. Crank angles corresponding to the beginning and the peak of each downstroke and EMG burst onset and offset crank angles were computed. Moreover, crank angles corresponding to the beginning and the end of muscle force response were determined assuming a 100-ms lag time between the EMG activity and the relevant force response (or electromechanical delay). **RESULTS:** Muscle coordination (EMG onset and offset) was altered at high pedaling rates. Thus, crank angles corresponding to muscle force response increased significantly with pedaling rate. Consequently, at pedaling rates higher than the optimal pedaling rate, force production of lower-limb extensor muscles was shifted later in the crank cycle. Mechanical data confirmed that downstrokes occurred later in the crank cycle when pedaling rate increased. Hence, force was produced on the pedals during less effective crank cycle sectors of the downstroke and during the beginning of the upstroke. **CONCLUSION:** During nonisokinetic sprint cycling, the decrease in power output when pedaling rates increased beyond P_{ROpt} may be partly explained by suboptimal muscle coordination.