

# On the Mechanism Design of an Innovative Elliptical Exerciser with Quick-Return Effect

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## Abstract

The objective of this study is to propose and investigate an innovative elliptical exerciser with quick-return effect that mimics the timing of the foot trajectory while jogging. At first, the innovative mechanism of the elliptical exerciser with quick-return effect is proposed. The structure and function of the proposed design are introduced. Then, the mechanism is analysed kinematically using the vector-loop method and motion geometry of the mechanism. An illustration is presented for explaining the design procedure of the proposed innovative design. Finally, the pedal trajectory of the innovative elliptical exerciser is simulated. The simulation results validate that the motion of pedal trajectory on the striding travel is faster than that on the supporting travel. Because of this quick-return effect, the timing of the pedal trajectory meets the principles of ergonomics and prevents the user suffering from muscle sore, pain or even injury.

**Keywords:** mechanism design, quick-return mechanism, elliptical exerciser

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