The Relationship of the Optimal Gait Pattern with Energy Cost upon Ankle Immobilization

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**Purpose:** The purposes of this study were to compare cardiopulmonary responses among four gait patterns and investigate the relationship between the optimal gait pattern and energy cost upon ankle immobilization.

**Method:** Thirty-seven healthy men participated in the study. Subjects were randomly assigned to one of four groups and instructed to walk using the specific gait pattern with or without (control) immobilization of the right ankle. The gait patterns were as follows: (1) external rotation gait (external rotation of the right hip and a toe-out gait; (2) circumduction; (3) toe gait (foot flat in initial contact and forefoot in contact from midstance to pre-swing; and (4) behind step gait (step at the back of the immobilized foot). Subjects walked on a treadmill at an incremental speeds (1.0, 2.0, 3.0, 4.0 and 5.0 km·h⁻¹). In addition, for each speed, eight subjects walked on a treadmill in free gait (no intentional dictation of gait pattern) with an ankle immobilized, and their observed walking patterns were categorized.

**Result:** Cardiopulmonary responses and energy cost per meter varied according to the gait pattern. Among the subjects who were allowed to choose their own gait patterns, none selected a gait pattern that required high energy cost and/or energy cost per meter.

**Conclusion:** Each gait pattern had unique characteristics. It is considered that individuals select optimal gait patterns to minimize energy costs.